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EDITORIAL NOTES—GAS, &c.

Gas Supply in the East-End of London.

IT was a plain tale that the Chairman of the Commercial Gas Company (Mr. W. G. Bradshaw) had to tell the proprietors at their meeting last Thursday; and, as a matter of fact, very few proprietors put in an appearance at the meeting to hear what he had to say—doubtless because the accounts were of such an eminently satisfactory character, and the Company had not been engaged in anything during the half year, except ordinary business, which could in any way affect their fortunes. Those proprietors who were present listened complacently to the story of progress, and extended their heartiest congratulations to all and sundry who had contributed to it. The Company is one whose business is quickened or retarded largely by the condition of trade; and its history during the past six months must, as a fairly sure indicator of improved conditions among the working class, be a source of satisfaction to students of the current social state. The same history also indicates that, but for the facility which the prepayment meter has introduced for doing business with the poorer inhabitants of the district, the business would have little more than maintained its *status quo*. The consumption of gas, with a total sale of 1,530,559,000 cubic feet, increased by 85½ millions, which is equal to 6 per cent.; and, regarded as a percentage as distinct from volume, the increase is the best record of the three London Companies in the half year. Of course, the increase was obtained chiefly from the additional connections of the preceding half year; and, when examination is made of the different classes of consumers as they stood at June 30 with the figures for the corresponding date of last year, no doubt remains that the accretion of consumption was derived almost solely from the expansion of the slot meter and stove business. As a matter of fact, ordinary meters, with 24,148 connected, show a decline of 106; but even in the East-end districts—with their great congeries of the poorer sections of our vast Metropolitan population—municipal trading in electricity is rampant, with results that are by no means favourable to the ratepayers. That small decline of 106 ordinary consumers in twelve months is, however, a clear manifestation that the Company have not suffered largely from the competition. Against it has to be set an addition of 5097 prepayment meters and 3772 stoves. There is room here for congratulation; and more particularly as there are no signs of any falling off in the applications. It is interesting to note that the past half-year's addition to the slot meter consumers has made their number (50,321) more than double that of the ordinary consumers (24,148). The stoves on hire total to 42,109; so that, as the number of consumers —ordinary and prepayment combined—is 74,469, there is (even allowing a fair proportion of privately owned stoves) a large field for extension of business in this direction. With the class of population in the Company's district, this business means in large part day consumption.

This is all exceedingly satisfactory. Prosperity, however, does not result from any single branch of such a large and varied business, but is the product of the agency of several benevolent concomitants. And there is one about which it would be of interest to hear a little more at a future meeting—that is, looking at the importance of the industrial side of East London, the position of the consumption of gas for power and industrial purposes, whether progress is being made, or whether rife competition is affecting it. It is a subject that will expand largely in interest with the passing through Parliament of an electricity power scheme; and such a scheme will, in all probability, be ratified by the Legislature in the session of 1907. If it is, the East-end of London will receive the earliest attention from the promoters of that scheme. The ordinary price of gas is now 2s. 5d.; and for power purposes there is a rebate. In the accounts, it is noticed that the number of public gas-lamps in the Company's district is now 4093, which is a reduction of only five in the twelve months, notwithstanding the occasional termination of contracts for small numbers of lamps in consideration of the welfare of necessitous municipal electricity supply undertakings. Albeit the number of public lamps remains practically stationary, it is observed that the item of "public "lights and under contracts" exhibits an increase in the demand for gas of upwards of 4 million cubic feet. This suggests that the power business is not standing still.

The finances of the half year, on the balance, also present satisfactory progression; but the items do not individually call for comment. Gas has yielded well; and the returns from residuals are higher, excepting breeze. On the expenditure side, a drop of £2786 is noted in purification. Of the £2285 which represents this item in the present accounts, £1830 was expended on labour; but the £2285 is nearly £300 less than the sum spent on labour alone in the purification department in the corresponding period of 1905. This is one satisfactory effect of the death of what Mr. Bradshaw aptly describes as a "superstition." After recent revelations affecting Poplar, and the notoriously prodigal manner in which the local government of certain East-end boroughs is conducted, it is not astonishing to find that rates have increased by £1771. To sum up, the profit of the half year is £62,311, which is an improvement of £6594. After satisfying all capital claims, there is a balance of £1936 to carry forward, making the undivided balance £19,410. The Directors have been considering the question of further reducing the price; but in view of the higher cost of coal and the prevailing uncertainty in this direction, they think it well to hold their hand for a time. However, excepting for this disturbing but important factor of coal, everything looks promising for a not remote further concession to the consumers; for there were half-concealed indications at the meeting on Thursday that the gas business during the current half year will, if present omens are fulfilled, bear favourable comparison with the one which has just given the proprietors so much reason for gratification.

Suburban Progress—Experiences at Tottenham.

A FEW weeks since, an editorial article appeared in the "JOURNAL," under the title of "Looking Forward in Lon-"don," in which reference was made to well-defined tokens that the future of gas supply in the suburbs of London would be substantially progressive in its prosperity. Every year the means of locomotion between the Metropolis and its environments are bettered and extended. Of this, all classes from rich to poor are taking advantage. It has also now been proved, beyond any question of doubt, that there is not a very lucrative business to be done by electricity suppliers in purely residential places. On all hands, the gas companies operating on the outskirts of London, with one or two exceptions, have shown extraordinary development in the past few years; and last half year some of them have, if anything, done better than ever before. One of the most remarkable instances of this growth is the Tottenham and Edmonton Company, who in the past six months increased their gas business by 12·4 per cent., added to their number of ordinary consumers 6·24 per cent., to the coin-meter consumers 15·4 per cent., and to the gas-cooking stoves 19·18 per cent. This concern might well be used as a study of the growing and recuperative powers of these suburban gas undertakings. Reconstruction and extension work there has been going on apace; but the expanding business has kept line with the additional capital charges and the considerable dips into revenue for replacements and maintenance. Though a reduction of 2d. was made in the price of gas last January, at the end of the half year the profit is found adequate to the payment of the extra ¼ per cent. to which the shareholders are entitled, to the putting of a round £1000 to the insurance fund, and to the making of an addition to the undivided balance.

In this state of things alone, there was sufficient reason for the meeting of the proprietors last Saturday being one of an exceptionally attractive nature, and for inducing the large attendance that it was Mr. Corbet Woodall's pleasure to address. But there was more. This meeting marked what to all intents and purposes is the completion of the large scheme of works reconstruction and extension that the Engineer (Mr. A. E. Broadberry) commenced six years ago, and which has completely transformed the works in Willoughby Lane. What a contrast between the works as they were prior to that time and as they are now! Though the old works did well, and were sufficient and efficient for their day, looking backward from the standpoint of the present, the difference is as between the noble and the mean. Pertinent to all this expenditure on the works within the six years, supplemented by that which the expansion of business has required outside the works, are three statements in Mr. Woodall's address on Saturday that must be gratifying to all concerned in the Company, and especially so to Mr. Broadberry. One was that the capital in relation to the gas sold again showed a reduction; the second, that the charge upon the gas for dividend and interest is, with only one exception, lower than in any other London or Suburban Company; and the third—and this is due to the reconstructed and new works—that, although the price of coal was higher in the past half year by 5d. per ton, because of better carbonizing results the charge for materials per 1000 cubic feet was less. This, of course, is the result of opportunity and modernity. Difficult and anxious though the conditions have been, it is not given to every gas engineer to have forced upon him such big growths, demanding drastic reorganization and large addition, and at the same time have the kindly advantage of so increasingly profitable a business to meet financial obligations.

But, already, with such prosperity, the Company are looking forward to the erection of further works on newly acquired land adjoining the present ones; for, indeed, with the present rate of increase in the gas business, the time when these works will have to be started is within measurable distance. Powers for their construction have been obtained in the Act which has lately received the Royal Assent, and which Act Mr. Woodall spoke of with emphatic satisfaction as having been obtained with the minimum of trouble, through the judicious attitude of the Local Authorities. It is an Act which assimilates statutory to practical requirements. The illuminating power is to be restored to 14 candles; for any higher power is rightly described by the Chairman as an extravagance. The restriction as to sulphur compounds other than sulphuretted hydrogen has also been ruled out by the new Act. The Company have, at the same time, secured authorization to supply a second quality of gas for power purposes; and the next we shall hear about this movement is as to whether terms can be arranged satisfactory to both users and suppliers. Such a dual supply is in the nature of an experiment; and, of course, no hasty determination can be made. All these changes, extension of powers, and completion of plans so far formulated, end, so to speak, the preface to new chapters in the Company's history. The first chapter commences well. Coal is somewhat dearer; but there is the cheaper gas and a large and developing district. Residents and consumers are becoming more and more financially interested in the concern. For instance, of the last issue of £25,000 of stock, 59 per cent. was placed in the district. It is believed, too, that better prices will be obtained for residuals, especially for coke. The cement makers are very busy just now; and therefore both in demand and price, it may be anticipated, there will be improvement. For this and other suburban companies expectations are good; and the grounds for them appear to be most substantial.

Thiophobia.

In the person of Professor A. H. Church, F.R.S., the distinguished Chemist to the Royal Academy of Arts, a new alarmist in regard to sulphur in illuminating gas has appeared. "A Memorandum on Frescoes in the Houses of "Parliament," issued on the 13th inst., contains a letter from Professor Church to the First Commissioner of Works, covering a memorandum "Concerning the Wall-Paintings "in the Palace of Westminster." In the course of the document, after reference to certain wall-paintings, and the manner in which he proposes to deal with them, the Professor concludes with the following paragraph: "The advisability "of cleaning and repairing these and the other wall-paint-"ings in the Palace of Westminster at intervals of three "or four years, has become more evident to me than ever "before, after my recent experience. The increased and "increasing consumption of coal in London, and the greater "license allowed to the Gas Companies in the matter of "freeing their gas from sulphur compounds, must result in "a serious augmentation of the amount of sulphuric acid in "the air of the Metropolis. This acid it is which constitutes "the chief destructive agency at work on pictorial and other "artistic productions."

We are not disposed now to question Professor Church's pronouncement that it is sulphuric acid which is the chief destructive agency at work on the Westminster paintings; but we are anxious to know what ground he has for the statement that, *inter alia*, "the greater license allowed to the "Gas Companies in the matter of freeing their gas from "sulphur compounds must result in a serious augmentation "of the amount of sulphuric acid in the air of the Metro-"polis." Does Professor Church know the extent of the augmentation, so far as gas is concerned; and, if so, does he pretend that it is serious? Crude coal gas contains, in round figures (say), 800 grains of sulphur per 100 cubic feet, of which about 20 grains have always been allowed to remain in the gas distributed to consumers in London. The "greater license" now allowed to the Gas Companies extends this limit to, at the most, an average of 50 grains. Thus formerly 780 grains of sulphur were removed; but now perhaps only 750 grains are removed. A serious difference, forsooth!

Let us look at the question from another standpoint. A ton of gas coal contains, as a rule, about 35 lbs. of sulphur. The gas made from it, under the old London sulphur restrictions, might have contained 0·3 lb. of sulphur. Now that these restrictions are removed, it may contain perhaps as much as 0·7 lb.; that is to say, an increase of 0·4 lb. when the quantity involved is 35 lbs. Perhaps Professor Church would prefer the coal to be burnt in domestic grates, and the greater part of the 35 lbs. of sulphur sent into the atmosphere as sulphuric acid, rather than that the use of gas should be extended by the cheapening which the slight increase in the permissive amount of sulphur in the gas involves! The imposition of sulphur restrictions curtailed the use of gas as fuel, and consequently put the direct consumption of coal, with its 35 lbs. of sulphur to the ton, on a higher level. The removal of the restrictions furthered the use of gas as fuel, and so tended to lessen the direct consumption of coal in London. Is it better to burn a little gas, representing 0·3 lb. of sulphur per ton of coal carbonized, and much coal containing 35 lbs. of sulphur per ton, or a lot of gas, representing 0·7 lb. of sulphur per ton of coal carbonized, and but little coal of 35 lbs. of sulphur to the ton? In any case, what really matters an increased allowance of about one-hundredth of the total sulphur in the coal?

These considerations display the essence of the sulphur-in-gas question, at least in regard to the outside air; and if Professor Church will but ponder them, he will surely realize that the best way to avoid any serious augmentation of the amount of sulphuric acid in the atmosphere of the Metropolis is to encourage the use of gas as fuel in place of coal, even though the gas contains as much as one-hundredth of the sulphur in the coal from which it was produced more than formerly.

The Irish Association Meeting.

The meeting of the Irish Association of Gas Managers in Dublin last Tuesday was the most imposing the Association has ever held. It was the most numerously attended—the register of attendance showing as many as sixty present, which is nearly two-thirds the membership. This is most creditable for members so widely scattered as those holding positions as gas managers in Ireland. Much of the success of the meeting was undoubtedly due to the personality of the President (Mr. R. Bruce Anderson), who, ever since the Association was extended in its scope, so as to include the whole of Ireland, has never ceased to devote himself to its interests, and, as matter of fact, has made himself one of the members in a way which appeals to the warm hearts that beat in the organization.

Of the many topics touched upon in the address particularly worthy of attention, were the President's thoughtful remarks on the indenturing of apprentices and the forming

of sick clubs. The underlying idea is the improvement of the workman, alike in quality and status. His doctrine may possibly not be generally accepted, that the duty of a gas manager should be to first secure a reasonable dividend for the shareholders, then to increase the wages of the workman, and only after these two purposes have been effected to cheapen the gas to the consumers. But it is sufficiently striking to make it worthy of consideration. Of course, a gas undertaking cannot exist without consumers; but the President's opinion seems to be that they are to be obtained, and retained, rather by the manifestation of a spirit of just independence than by the offering to them of cheap gas. If cheap means nasty gas, he is quite right. But, on the other hand, an undue attachment to a high dividend is not found to be conducive to the prosperity of an undertaking. Perhaps the President's reference to the self-interest of shareholders would, in most instances, furnish the golden mean in the matter of dividends and prices of gas. Sometimes, however, the mean is not traceable, or, if it be, is far removed from what may be regarded in any sense of the word as "golden." When thus thought out, the utterances of Mr. Anderson will probably, if they do not fall on deaf ears, be productive of good.

Taken as a whole, Mr. Anderson's many-featured address was commendable, and much was said in it to which progressive gas engineers will be prepared to give very real support. But there is one part—that treating of low-grade gas—over which many will be disposed to take side against the President; for in it he makes some strange and fanciful flights. He appears to give adherence to Mr. Shadbolt's unorthodox method of diluting his coal gas by gas drawn from the retort-bench producers. When Mr. Shadbolt gave publicity to his trials in this direction, the idea was described in the "JOURNAL" as an economical fallacy; and nothing has since transpired to alter that view. It was also, at the time, suggested that what had been done at Grantham did not contribute in any way to the problem that is now before the gas profession, of how to reduce illuminating power without proportionately diminishing the calorific power. It was further asserted that Mr. Shadbolt did an injustice to the consumers of his gas for heating and for power purposes, by materially reducing the calorific value of their gas; and, this being so, the consumers ought to be compensated. This, Mr. Anderson says, was the "most forcible, "though foundationless, argument" against Mr. Shadbolt. But the President simply postulates when he speaks of the argument being "foundationless;" and he then slips off into some commonplace remarks on the question as to what the gas consumers of Grantham were themselves wasting before dilution, and what they compulsorily lost after. This is an evasion of the real point—an evasion which is repeated at the end of this section of the address, where the information occurs that, in one or two towns with which Mr. Anderson is connected, they have been experimenting in diluting the ordinary gas by producer gas; and so far their observations indicate that "large percentages of producer gas may "be introduced without materially changing the illuminating "value of the gas." What are the observations as to the calorific value? There is not a word on that point of present importance. Mr. Anderson has much to tell beyond the frugal amount of statement he adduces under this head in the address, before he can be taken to have made any rational or substantial contribution to the subject. The President can be uncomplimentary when it pleases him; but never has he been more so than when he characterizes as "rubbish" and "hypocritical special pleading" that which has been spoken and written about justice to gas consumers in this matter of reduction of illuminating power. The elegant terms in which he expresses his disapproval will come in useful for that great majority of gas managers who will not be prepared to endorse his own utterances in this connection.

The papers before the meeting—three in number—were devoted the first two to policy, and the last to a technical subject. Mr. James Brodie, of Omagh, gave a *résumé* of his experiences in the chequered proceedings which have resulted in the transfer of the gas undertaking he manages to the Local Authority; and the contribution emphasizes how in recent transfers the relative positions of statutory and non-statutory concerns have become narrowed—to the advantage of the latter—in the matter of the price which an expropriating authority has to pay. Mr. J. F. Davies, of Manchester, dilated upon the extensive field there is yet undeveloped for the sale of gas, chiefly for cooking and heating. This was a paper by a commercial gentleman; and, as such, the case for the manufacturers was stated with all possible clearness. It is in the interests of gas managers that they should be acquainted with the latest and best in appliances for the use of their gas; and this epitome of results and advantages, manifestly carefully prepared by the author, should be very helpful to them in pushing business. The technical paper was that given by Mr. J. B. Tully, of Kinsale. Mr. Tully was only admitted a member of the Association in the forenoon, and a few hours later he was found delivering an illustrated lecture upon a chemical subject. Unfortunately for him, time was against him; and so the paper did not receive the ample justice it would have had earlier in the day.

It has been resolved to hold the meeting next year again in Dublin; the reason being that the Irish International Exhibition will then be in full swing. Following the adoption of that resolution there was a long discussion as to the attitude of the Association towards the Institution of Gas Engineers, which is to meet in Dublin next June. A letter from the President of the Institution (Mr. Charles Hunt) asked a favour from members of the Institution in Ireland; the Irish Association—presumably out of courtesy—seeing that it is an affiliated body, being made the medium of the request. The favour asked was the contribution of papers, which was quite a reasonable request. But in the long and rambling discussion which ensued, it was entirely lost sight of, and the speakers went stumbling over obstacles which they themselves had set up. The Institution cannot do anything for the Irish Association beyond opening their meetings to the members; neither is it to be expected that the Institution would encourage the Association in any movement for the effacing of themselves for even a single year. To do so would imply that the Institution must reciprocate with some benefit to the Irish Association, which they cannot do without disturbing the constitution of the Association for that year, seeing that "extraordinary" members are allowed at the meetings of the Irish Association, but are not in the Institution. The Irish Association is affiliated to, but not merged in, the Institution; so their meetings or excursions cannot be merged. Whatever may be done in regard to the Irish Association need not be a binding precedent; but it would have considerable force in determining the procedure of the future. There is, consequently, need for the matter receiving careful consideration. The subject has been remitted to the Committee of the Association, who will, it is to be presumed, put themselves in communication with the Council of the Institution; and when they get into touch with each other, it may be that the way out of the difficulty will be found to be much easier than it at present appears to be to some of the members of the Irish Association.

Cautioning Shareholders.

AT two meetings of proprietors in gas companies within the past fortnight, monitory remarks have been addressed from the Directors' side of the table concerning prospectuses of new gas companies of dubious financial prospect. The first piece of sage advice was given by Mr. John Mews at the meeting of the South Metropolitan Gas Company; and then Mr. H. E. Jones made a vigorous onslaught, at the meeting of the Wandsworth and Putney Gas Company, on this modern system of launching gas weaklings on the public with enormous capitals, and inundating shareholders of prosperous gas undertakings with the prospectuses and circulars. In his position as Chairman of the prosperous Wandsworth Company, Mr. Jones has reason for being jealous of the good name that gas holds as a security; for that concern is now selling gas at a record price for a Suburban Gas Company—viz., 2s. per 1000 cubic feet, with a 10 per cent. reduction for power. However, steps have been taken to ensure that the whole of the proprietors of both the South Metropolitan Gas Company and of the Wandsworth Company shall receive copies of the reports of the proceedings at their respective meetings containing the warnings referred to. If the Directors of all Gas Companies would take similar steps, it would go far in freeing the gas industry of this modern trouble, and the plague of flattering and richly-baited prospectuses.

Another aspect of this question is the worry to which Secretaries of Gas Companies are being put in providing the names and addresses of shareholders for individuals

interested in circularizing them. It will be seen from the report of the Wandsworth meeting that the Secretary has received a communication from a stockholder in the Company—a very small stockholder in one class only—who will be "obliged" if the Secretary will send him the names and addresses of the debenture and ordinary stock holders in the Company. The applicant has indited his letter in much the same terms as one would expect from an amiable and harmless collector of autographs. He says he only wants the names and addresses for his "*private use* as a com- "piler of investors in gas and water securities." That looks innocent enough; and the apparent innocence is supported by the letter emanating from a private address. We have heard before of these applications to Secretaries, and, knowing what we do, cannot believe in the absolute correctness of the employment of the words "for my private use" in the application to the Wandsworth Company. Of course, it may be that the person signing this particular application may attach a broader interpretation to the words "for my "private use" than we or the Chairman and Directors of the Wandsworth Company do; but that there is a motive ulterior to that of compilation is beyond question. The Company are taking legal advice as to whether they are compelled to supply this small debenture stockholder with the names and addresses of other proprietors in the Company, even though he mentions something to the effect that, if the Secretary will condescend to send him the estimated cost of the list, he will be pleased to forward "a deposit." The Directors of other Boards have been in similar doubt; and it would be interesting to hear from the Wandsworth Company the opinion of their legal adviser. We know pretty well what his view will be. But circumstances alter cases; and sometimes even in the Law Courts recognition is made of the maxim "*Summum jus* "*summa injuria.*"

However, we can all do something in assisting to stamp out this new growth, by making the field for it as sterile as possible. Therefore, it is hoped that other Directors will follow the example set them at the South Metropolitan and Wandsworth meetings, and speak with no uncertain voice so as to effectively arrest the attention of their shareholders. Directors owe it to shareholders to do all that is reasonable to protect them from any ill-consequences arising from connection with their companies.

The Report of the Chief Inspector under the Alkali Acts.

The annual report of the Chief Inspector under the Alkali Acts was issued last Friday—a few weeks later than usual, owing, unfortunately, to the illness, during the closing months of the past and the early months of the present year, of Mr. R. Forbes Carpenter, who is responsible for the report. It is, however, none the less welcome, as it contains several features of interest to people engaged in the gas industry. Some of these are indicated in the notice of the report which appears elsewhere, and opportunity may be taken for dealing with them more fully in a subsequent issue. Meanwhile, we note with satisfaction that though 1068 works were registered last year, and 1481 processes carried on therein, the 5315 visits paid by the various inspectors and the 5137 tests made by them resulted in only one prosecution—for allowing the escape of noxious gases evolved in the manufacture of sulphuric acid. This is striking evidence of the care that is taken to comply with the provisions of the Acts. Our readers are aware that, through the courtesy of manufacturers, Mr. Carpenter is able to give in his annual reports statistics in regard to the production of sulphate of ammonia. Those for the past year show that the most important contributor is still the gas industry. The quantity of sulphate produced in gas-works in 1905 was 155,957 tons, compared with 150,208 tons in 1904; and the total was 269,114 tons, against 245,990 tons. The increase took place principally in the manufacturing districts of the Midlands and North of England, where stagnation of trade had previously tended to check the output of gas. We have on former occasions pointed out that these reports are no mere records of inspections and routine work. They embody the results of original investigations of considerable value. This year, Mr. Linder, Mr. Carpenter's Assistant, presents memoranda on the constitution of ammoniacal liquors, especially with reference to cyanogen compounds, and on the conditions affecting the formation of ferrocyanides in sulphate of ammonia saturators. In the latter investigation he was assisted by Mr. Sutton and Mr. Young, two of the District Inspectors; and facilities were afforded by the South Metropolitan Gas Company for carrying out a series of experiments at their East Greenwich station. Records like these, of independent work, remove Mr. Carpenter's reports from the ordinary category of Blue-Books, and impart to them the value of scientific publications.

Labour-Saving Machinery for Medium-Sized Works.

In another part of the "JOURNAL" will be found a paper on the above subject presented by Mr. F. H. Shelton, of Philadelphia, at the last meeting of the Western (U.S.A.) Gas Assotion. He points out that many gas companies of medium size have been desirous of superseding hand labour by machinery in the retort-house, but have been deterred from doing so by the heavy expense usually considered necessary for the installation of the plant. Having had this matter under consideration in connection with two or three gas companies, and worked out an arrangement which presented most of the advantages desired without entailing excessive outlay, he submitted the details for the consideration of his colleagues. There was really only one speaker on the paper—Mr. Frederic Egner, who thought horizontal retorts were out of date, having been superseded by verticals. His point consequently was: Why employ machinery to charge and draw retorts when the work can be done by gravity? The paper was not passed with Mr. Egner's observavations only, as some remarks on it were contributed in writing; and these were read. Mr. H. Graff thought that an installation of machinery could be put up for the price mentioned by Mr. Shelton, but that the item for labour would be higher than he had stated. Mr. B. O. Tippey expressed the opinion, based on his experience with drawing and charging machinery, that many medium-sized retort-houses now operated by hand labour could be profitably worked by machinery, and thereby the chances of labour trouble be lessened. Of course, Mr. Shelton did not submit his scheme as applicable to very small or to large works; but he offered it as a means of enabling those of moderate size to "get upon a machine basis," as he put it.

Disagreement among Trade Unionists.

According to the *agenda* which has been issued for the Trade Union Congress at Liverpool next month, the proceedings are likely to be lively, if not turbulent. The members are to be asked to determine by formal resolution whether Trade Unions are to be composed of Government or Municipal employees, without regard to the nature of the trade to which the men belong, and whether the Unions are to act in such a manner as to force the Government or the local authority into giving better conditions than are obtainable for the same class of work from an ordinary good employer. The question will be debated upon a motion of which notice has been given by the Amalgamated Association of Tramway and Vehicle Workers, in conjunction with three other Unions, one of which is the National Union of Gas Workers and General Labourers. The resolution they will submit is to the effect that any method of organization which seeks to divide workmen employed by public authorities from their fellows in the same occupations employed by private firms is detrimental to the best interests of Trade Unionism. The issue thus raised is boldly faced by the Municipal Employees' Association, containing some 5000 members, who have sent in an amendment which directly traverses the resolution. They wish to have it affirmed that such division of the workmen is not detrimental to the personal interests of the Tramway and Vehicle Workers and the Gas Workers, by the unskilled workers of municipal bodies having a Union of their own. The question is one of general interest, for, as those who are in favour of the policy outlined in the first resolution declare, the inevitable result of the whole of the municipal employees belonging to one Trade Union which excludes men who are not in the employ of a municipal authority, would be that the public would be "squeezed" into granting conditions which no private employer could afford to give, and that the Trade Unionist in the service of a private firm would have to pay to keep his fellow in the same class of employment in a condition much better than his own. To all appearance, therefore, there is likely to be a stiff contest.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 542.)

MOVEMENTS in the principal markets of the Stock Exchange were irregular and fluctuating. If on one day some of them went up and others down, the next day the motion was reversed, and they returned to their old positions. But gradually the advances outstepped the retrogressions, and prices closed for the most part higher. Consols were not at their best; but some of the more enterprising departments had a good rise. South Africans recovered before the close; and American Rails had a great fillip up. It was settlement week, and the account was a heavy one, which tended to repress fresh business. It was a short week, too, Saturday being a holiday; and on Friday there was some realizing to close accounts. In the Money Market, there was a good demand; and rates for short loans were firm, though they eased before the close. Discount rates held firm throughout. Business in the Gas Market was good and brisk, considering the holiday season, with a remarkably strong tendency ruling. A glance at our Stock and Share List will show a long array of improvements in the quotations of undertakings of all descriptions, perhaps more numerous than we have had to record in any one week, which affords very good proof that investments in the gas industry are not going back in public favour. In Gaslight and Coke issues, the ordinary was fairly active; changing hands at from 100¾ to 101 *cum div.*, and at from 98¼ to 99 *ex div.* The secured issues were quiet; the preference marking 108½ and 109½ *cum div.*, and the debenture 86½. South Metropolitan was quiet and strong. Transactions were marked at 134 *cum div.*, and 131¼ *ex div.* The debenture was dealt in 86¾. Not much was done in Commercials; but the 4 per cent. was marked at 115½ and 116½, and the 3½ per cent. at 113. The Suburban and Provincial group were at about their usual rate of pressure. Alliance old changed hands at 21⅜ (a good advance), Brentford new at 202 *ex div.*, and Bournemouth preference at 16$\frac{1}{16}$; while several others advanced without business being marked. On their local Exchanges, Liverpool and Newcastle had a rise each. Shrewsbury has dropped out of quotation. In the Continental Companies, Imperial was strong and active, and prices at which bargains were marked rose from 183 on Tuesday to 185½ on Friday (a rise of 2½ in the quotation). European part-paid was done at 18½ and 18⅜; and Union at 123½. Among undertakings in the remoter world, Bombay new changed hands at 5¼, Buenos Ayres at from 12¼ to 12½, ditto debenture at 97⅞, Primitiva ordinary at 6⅞ and 6$\frac{15}{16}$, ditto preference 5¼ and 5$\frac{15}{16}$, River Plate at 12⅝, ditto debenture at 96¾, San Paulo at 14⅝, Monte Video at 11⅜ and 11½, and Melbourne 4 per cent. at 103⅝.

The closing prices are shown in our Stock and Share List on page 542.

ELECTRIC LIGHTING MEMORANDA.

Want of Precision in Electricity Meters—Official Testing and Certification—The Limit of Error—The Dismal Condition of the Electrical Manufacturing Industry—Slow Progress of the Lighting Business in the Provinces—Un-neighbourly Generating-Stations—Workhouse Lighting.

ELECTRICITY meters appear to be anything but instruments of precision; and to the other drawbacks to which he submits himself by becoming a patron of an electricity undertaking the consumer has to add the disadvantage of not knowing whether his meter is telling the truth. Although he pays dearly for his light in comparison with his neighbour using incandescent gas-burners, the illuminating power of the lights fluctuates through the capricious voltages with which he is favoured from the electricity station, and occasionally his lights collapse altogether, or a fuse gives out at an inconvenient time. Now, if the consumer reads the electrical papers, he will learn that no reliance can be placed on the meter which is used as *primâ facie* evidence of the amount that he is expected to pay the electricity undertakers for the service rendered. Electricity meters appear to be difficult to construct with any certainty of accuracy in performance; and if they start well, they are susceptible of easy derangement. On the first point, the report by the Highways Committee of the London County Council tells a tale. During 1905, the officers of the Council tested 2396 new electricity meters, of which only 1226 (or 51 per cent.) were passed as accurate at the first testing, 410 (or 17 per cent.) were passed as accurate after adjustment and further testing; and 760 (or 32 per cent.) were rejected as inaccurate. If they are accurate when fixed, it is confessed in the "Electrical Review," by correspondents of practical experience, that no one can guarantee a continuation of veracity, nor, when found out and there is adjustment, how long before there will again be back-sliding. One correspondent says there may be failure even by "a small piece of enamel or dirt falling on to the disc, and getting wedged under the brake magnet." Another makes the significant admission that the testing of "new meters fresh from the manufacturers is of little value. A real reliability test can only be obtained after a meter has been (say) twelve months on circuit in a consumer's premises. Then the whole train of wheels can be fairly accepted as being in gear and locked in the position in which they are destined to work." A further correspondent instances a meter that stuck, and required two 16-candle power lamps to start it. We ourselves have come across an electricity consumer who boasted that during the long nights of two winters he used an electric night light without any movement of his meter. But while he boasted of this, he had little to say on the fact that his change to electricity was costing him, when he eventually got lamps enough into his house, nearly treble what it did when he used only incandescent gas-burners. These are all instances where the meter favoured the consumer; but if meters err on one side, they may be depended upon for erring at times on the other.

The General Electric Lighting Acts make no provision for the examination and certification of meters, such as the Sale of Gas Act, 1859, provides in the case of gas. The electricity consumer has no protection. He is committed to the readings of an instrument whose good faith has no guarantee, and whose abiding honesty even electricians will not vouch for. The case is far different with the officially tested and stamped gas-meter. Electricity meters are occasionally tested by the electricity suppliers; but such tests (which cannot be esteemed as impartial) cannot be accepted as the equivalent of the official tests and certification that obtain in the case of all gas-meters. The London County Council are, for these reasons, taking steps to promote further legislation to secure an official test in the Metropolis for electricity meters, and to impose penalties for the fixing of meters that have not been so certified. In the correspondence in our electrical contemporary, there is further evidence as to the difficulty of attaining and maintaining precision in the case of electricity meters. No gas-meter is stamped when it varies from the true standard more than 3 per cent. in favour of the buyer, and more than 2 per cent. in favour of the seller. Some of the correspondents in the "Electrical Review" are opposed to any such narrow legal limit for electricity meters; and 6 per cent. in favour of the consumer and 4 per cent. in favour of the seller are mentioned as suitable variations from the true standards. See what this means as between consumer and consumer! One buying through a meter 4 per cent. in favour of the seller may be paying 10 per cent. more than his neighbour whose meter is 6 per cent. slow in registering. To ask for such a wide variation is to admit that at best an electricity meter is only a rough calculator. The buyer of electricity can repose greater faith in his greengrocer's scales than he can at present in the instrument used to measure his consumption of electricity.

The electrical manufacturing industry appears to be in a luckless way. The companies engaged in the industry have been under a cloud for some years; and the recent reports and the proceedings at meetings do not encourage the feeling that prospects are brighter. The reasons that are adduced for this state of things are many and extremely diverse. Taken alone, probably not one of them explains the cause of the dismal situation; but it is more likely that they are all more or less contributory. There is no doubt that there has been an excessive expansion in this country of works for producing electrical machinery; and a great deal more capital has been spent than the outlook justified. That is usually the case with electricity works of all kinds. The result, however, has been cutting competition; and cutting competition can only have the one effect of low prices. American and German competition has also been very keen; and combined with these unfavourable conditions has been the heavy rise in raw materials —particularly of copper. One or two concerns have done better than in immediately preceding years—Cromptons, for example—others have done worse; and the majority have shown no signs of improvement. Directors have tried to put heart into their shareholders by pointing to a speeding-up of business; but larger contracts are no good if they do not produce better profits. Most of the reports indicate that there have been drastic doings in workshops and management, in the way of bringing about economies and improvements, and reorganization, and in broadening the basis of operations. The Chairman of one Company declares that it is now a question of the survival of the fittest, which is another way of saying that some of the concerns have got to depart this life. The low water in which the Companies are floating is apparent by three or four illustrations. Crompton and Co. paid 2½ per cent. in 1904-5 by drawing from the reserve; but in the past year they have done somewhat better, as they are able to pay from the profits 2½ per cent., and carry an amount to reserve. Thomas Parker and Co. have an adverse balance; the Electric Construction Company have only £6045 available for distribution; the profits of the General Electric Company are £3000 less; and Edmundson's are paying a reduced dividend.

Edmundson's Electricity Corporation, last mentioned, is a particularly interesting concern, as a large part of their capital is invested in electricity supply undertakings; and their report is somewhat of an index as to the progress of the lighting business in the provincial districts in which they are interested. The report states that the interest and dividends receivable from the investments in lighting companies have only increased by £2078. It is a disappointing position that, with increased investments to the amount of £132,509, and a transfer from non-dividend earning to dividend-earning stage of about £39,000, so small an increase in interest and dividends should result. The explanation given is twofold: Business generally was not brilliant in the early part of the financial year, and "economy was practised by users of current for lighting." The second reason is that, acting upon

optimistic views, the expert advisers of the Company have recommended the outlay of capital in some instances in advance of what has proved to be the requirements. The pious hope is expressed that this will largely correct itself in time; but meanwhile the effect is obvious. Grave doubts are entertained, too, as to the future of the Lancashire Power Company, which is known in the North as "Edmundson's folly." By the time the Edmundson Company have finished investing in that concern, their liability will probably be not less than £100,000.

Electricity generating-stations are not regarded as desirable neighbours; and they have been prolific of litigation at the instance of people who have an objection to living in a state of almost perpetual motion. It is not—to those of us who are not sailors—a pleasant thing to have "visual signs" of vibration in one's living-rooms—constant and not temporary as might be occasioned by passing trams or other vehicular traffic. Just recently, for such reasons, Mr. Westlake and others have had the St. Pancras Borough Council before Mr. Justice Neville. The evidence adduced gave no room for doubt as to the truth of the allegations of the plaintiffs; and an injunction was granted against the Council restraining them from using any engine so as to cause a nuisance to the plaintiffs. One part of the case had reference to the emanations of a dust-destructor; but his Lordship took into consideration that since 1894 plaintiffs had done nothing in respect of the alleged nuisance. The evidence on this point he described as vague, inaccurate, and somewhat exaggerated. The omission of the plaintiffs, however, to take action earlier appeared to make the deepest impression on his Lordship. The moral is, do not procrastinate in these matters. The Walthamstow generating-station has also been the cause of some incipient litigation, which has come to a timely end through the Council consenting to undertake the necessary remedial measures, and to bear the legal expenses incurred.

We hear a lot about the paper estimates of the lighting of workhouses by electricity, and how much cheaper such lighting is than gas. The officials of workhouses appear to be in possession of some easy method of persuading Boards of Guardians that this is so; but such scant information is afforded that it is impossible to apply any satisfactory test to their figures. A strange part of the business is that, after the estimates, we never hear anything about how they have worked out when the scheme has materialized. Apparently, even in the initial stage, the expenditure, in the case of the electric lighting of the Hammersmith Workhouse, has not run parallel with the estimates; for Mr. A. D. Gordon, one of the Auditors of the Local Government Board, has had occasion to surcharge four members of the Board of Guardians in connection with the lighting contract. It seems, according to one report, that in the accounts of the Guardians for the half year ended Lady Day last, Mr. Gordon disallowed £798 13s. 1d., entered and charged as payments to various persons under the heading of electric lighting, &c. (workhouse and infirmary account). He surcharged Mr. Pascall with £763 7s.; Mr. J. L. Apsey and Mr. G. Jarvis with £798 13s. 1d.; and Mr. J. Glasier with £35 6s. 1d. The disallowance of the amounts in question was made on these grounds: (1) Because the Guardians had to that extent expended in respect of electric lighting beyond the amount sanctioned by the Local Government Board; (2) because Mr. Gordon was not satisfied that all the payments in question were reasonable, or that all the work was properly ordered or authorized to be carried out by the Guardians; (3) because proper particulars had not been produced of some part of the expenditure; and (4) because there was no authority for the expenditure or for charging it on the poor rate. The Guardians, of course, will not suffer any pecuniary loss; perhaps it would be a good thing for the public if they did. It would be a lesson to them and others to exercise a little more care.

Mr. James Beckett, a Director of the Broxham Oil Company, and lately of the Glenboig Fire-Clay Company, who died on the 28th of June, at the age of 78, left personal estate in the United Kingdom valued at £130,362.

It is reported to be the intention of the United States Steel Corporation, which controls the Indiana Steel Company, to make the Company's works at Gary (Ind.), the foremost American steel centre; and as a step towards this end, eight large gas-driven blowing-engines are to be installed there. Each engine will have a rated capacity on blast-furnace gas of nearly 3000-horse power, corresponding to a rating of 4000-horse power on natural gas. Each set will be arranged in twin tandem fashion, each side consisting of two double-acting gas-cylinders and one blowing-cylinder, in the opposed, or *vis-à-vis*, arrangement. The power cylinders are 42 inches and the air cylinders 68 inches in diameter, with a common stroke of 54 inches; the unit running at a maximum speed of 75 revolutions per minute. The capacity of air delivery at this speed will be 33,000 cubic feet of free air per minute at 18 lbs. pressure, with a maximum pressure delivery of 30 lbs. per square inch. This type of engine will not only be used for blowing purposes, but also for electricity generation, in which case a speed of 84 revolutions per minute will be maintained. The general design conforms closely to that of similar machinery installed for the Carnegie Steel Company at Bessemer, near Pittsburg. The Westinghouse Machine Company are the Contractors in both cases.

A PRIZE ESSAY ON GAS v. ELECTRIC LIGHTING.

A few months ago, the organ of the Electrical Contractors' Association considered it high time, in view of the uncomfortable pressure of the gas industry on that of electricity, that something should be done to "frustrate" the so-called "knavish tricks" of the former; and so the Editor, with great munificence, offered a prize of £5 for an essay on "Electricity *v.* Gas Lighting." It was suggested that the winning essay should be reprinted, and published for distribution. Well, £5 for establishing a hopeful condition of things in the electrical industry and for confounding the gas industry was not a big price to pay; but doubtless now that the Editor has seen the essays which were sent in response to his invitation, he has concluded that in the five-pound note there was surplus value. Anyway that is our opinion if the essay of Mr. George White, the winner, is really the best. Taking it as being so, then the Editor will do his readers a service by not cumbering his columns with the essays that succeed the best.

We cannot think that the competing essays have been submitted to an electrical engineer for judgment; as no self-respecting electrician would be prepared to permit such gross misrepresentations to pass as are contained in the winning essay. Why it won, is more than people outside the office of the "Electrical Contractor" will be able to fathom. But it appears from the Editor's statement that he was "influenced largely by the author's restrained treatment of the subject." That is excellent. The greatest restraint that we can find Mr. White has practised has relation to the short measure that he has given to gas; but when he deals with electricity, his conscience is not strong enough to restrain his pen. It is true that in one or two places the magnanimous spirit of Mr. White does peep out; for he finds occasional employment for gas where it cannot corrupt, or where a little more or less of its polluting qualities will not matter—perhaps, indeed, will do good in clearing off a few undesirables and public house loafers. For example, in hotels, we are told, electricity is the only correct thing; but for the public houses round the corner, gas is quite good enough. Of course, we are much obliged to Mr. White for his condescension in this matter. If, however, he were the arbiter in the artificial lighting of the country, what a good time the electrical industry would have, and what a bad time the gas industry would experience. But it so happens, in this free country, that the man who buys also decides; and the most popular form of lighting is still gas. Consulting the pages of memory, the name of Mr. George H. White does not occur as having come into any particular prominence as an authority on the subject of his essay; but we know well the names of Professor Silvanus P. Thompson, Mr. James Swinburne, Mr. Leon Gaster, Mr. Lancelot W. Wild, and others to whom it is intended to refer to confute the essayist, rather than attempt to do so by our own defensible assertions, which might, however, simply be dismissed by the other side as being prejudiced.

There is not much novelty about the first part of the essay, which deals largely with shop and theatre lighting, and says little about house and church lighting. Hotels, public houses, shops, and theatres are the places which apparently largely occupy the thoughts of the prize essayist. Much is made of the supposed superiority of electric lighting in point of attractiveness. It may be freely admitted that there is a limited class of shops where, from that single point of view, electricity has an advantage; but that advantage has been considerably lessened by inverted incandescent gas-lamps, of various sizes. In most towns, many shopkeepers have returned, and are still returning, after experience with an installation of electric lighting, to their old and less expensive love; and not a hundred or any other number of such essays as the one before us, would turn their belief in the veracity of their own personal experience. About theatres, Mr. White writes as though they were in greater part built of a large number of unventilated boxes, that ventilation ceases when gas is used, and that the resources of the architectural world have been exhausted in producing the ingress and egress of air in such buildings. If they had, it would be a bad thing for electric lighting; for while gas assists ventilation by creating an up-draught, the electric light instead of rendering that aid conduces to stagnation of the air. Headache can soon be produced in a room, improperly ventilated, where electric light is employed. In dealing with this part of his subject, Mr. White speaks of "each 5 cubic feet gas-jet." When will electrical people have the honesty to recognize that each 3½ cubic feet incandescent gas-burner displaces about half-a-dozen of the old 5 cubic feet gas-jets? Long before the incandescent gas-burner had attained its present popularity, the "Lancet" stated that any carbonic acid from the combustion of coal gas was quite "insignificant compared with that exhaled by the human individual. Of the two, the human exhalation is much the more prejudicial to health." Mr. White's chit-chat, or parrot talk, on this subject—it has all been said so many times before—may be passed without further notice. The same with regard to the cleanliness of electric lighting compared with gas lighting. Incandescent gas-burners, especially the bijou form of inverted burner, has done much to destroy the effect of the long-sustained prating on this head.

Then there appears again the threadbare question of the relative fire risks of electricity and gas; and, of course, Mr. White again indulges in platitude to show that electric lighting is vastly superior to gas lighting. Record does not support him. Last week,

in our "Electric Lighting Memoranda," the catastrophes at Milan and at a drapery establishment in South London were noticed; and time and again disastrous fires have been chronicled which have been traced to electricity. When electricity starts a fire, it does not do the thing by halves. It works covertly and insidiously; whereas fire by gas cannot happen unless there is contact with the flame, or unless there is an escape and carelessness or accidental ignition. As to escapes, the greatest protection against fire is the unmistakable and arresting odour of gas; and now that incandescent gas lighting is the vogue, there are few of those unprotected gas-flames that obtained a few years ago. The last annual report of the Fire Brigade Committee of the London County Council showed that, in proportion to the number of consumers, more fires were caused by electricity than by gas in London during the year—the ratio being one fire to every 2000 gas consumers, and one to every 1000 electricity users. The regulations for wiring issued by the Board of Trade, and by the Institution of Electrical Engineers, and the requirements of the Fire Insurance Companies are eloquent of lurking danger in several directions, and the slightest neglect or carelessness may bring about dire results. No such regulations are required in connection with gas. Many instances can be quoted where wholesale destruction—running into thousands upon thousands of pounds—has been produced by unexpected defects or conditions in an electric lighting system; but we defy the electricians to quote cases of gas-generated fires that have had comparison in destructiveness with those that the authorities have attributed—and not without cause—to electricity. The very precautions (which are not always effectual) that have to be taken with electricity, are a sufficient rebuff to the wild and inconclusive statements of electricians in this connection.

Leaving the essayist's generalities for his figures, we have to join issue with him over most of them. In his comparisons, he takes 4d. per unit for electricity, and 3s. for gas as a fair and impartial price, because in country districts, owing to the restricted scope for business and the price of materials, the charge for gas is higher than in the great centres. We have in London one Company charging 2s. 11d. for gas for private purposes, this arising from a past and not the present policy. But the other Companies are charging much lower rates. The South Metropolitan Gas Company are down to 2s.; and it will be found that in all the great towns where competition between the rival illuminants is the strongest, there the price of gas is substantially below 3s. We will, however, let Mr. White have whatever advantage he can extract from the 3s. The first claim, in considering comparative prices and economies, is that "the incandescent electric lamp will run effectively for about 750 hours, and a Nernst lamp for 500 hours; and during that time the variation in candle power is not likely to exceed 10 per cent." As already said, we are going to pit electricians against the prize essayist's statements; and therefore, on this head, appeal may be made to an article by Mr. Lancelot W. Wild published in the "Electrical Review" early this year. Mr. Wild there lays down the proposition that, owing to the deterioration of the illuminating value that takes place almost from the commencement of the life of incandescent electric lamps, it would pay to scrap them at a very early age were it not for the cost of renewals. With electricity at 4d. per unit, Mr. Wild puts the correct scrapping-point at 450 hours. That is 300 hours less than Mr. White's 750 hours. We have an interest in knowing where incandescent electric lamps that will run effectively for 750 hours can be obtained. Perhaps the prize essayist will inform us. Mr. Wild's average results of tests, with a large number of lamps bought over the counter, also showed that, at the commencement, an illuminating power of 16·7 candles was obtained, the consumption being equal to 3·58 watts per candle; at 100 hours, the illuminating power was 15·9 candles, the consumption 3·81 watts per candle; at 300 hours, 14·35 candles, and 4·13 watts per candle; at 600 hours, 12·65 candles, and 4·60 watts per candle; at 900 hours, 11·55 candles, and 5 watts per candle; and at 1000 hours, 11·3 candles, and 5·08 watts per candle. It is seen from these figures that, commencing at an average of 16·7 candles, the illuminating power, at 600 hours, had fallen to 12·65 candles; so that it may be taken that by 750 hours the variation, or deterioration, in the lighting power would be 25 per cent., and not Mr. White's manifestly hypothetical 10 per cent. In his Society of Arts paper early this year, Mr. Leon Gaster confirms this depreciation of the carbon filament lamp; and Sir W. H. Preece says "it cannot be said that much concrete improvement has been effected in the efficiency and economy of these lamps." All the prize essayist's calculations, however, are based upon the immutability of the incandescent electric lamp.

(To be continued.)

Through a failure at the gas-works, the town of Dorchester was plunged into darkness for half-an-hour last night.

Five men who were engaged in repairing a purifier at the Bedford Gas-Works were injured by an explosion there last evening.

After being without a constant water supply for seven years, Leigh-on-Sea yesterday obtained its supply from Southend; the Leigh District Council having sold the undertaking to a private Company for £14,000.

REPORT OF THE CHIEF INSPECTOR UNDER THE ALKALI ACTS.

THE Annual Report of the Chief Inspector under the Alkali Works Regulation Acts, 1881 and 1892 (Mr. R. Forbes Carpenter), was issued last Friday. It is the forty-second of the series, and gives an account of the work done during the past year. As usual, it is accompanied by the reports of the various District Inspectors and that presented to the Secretary for Scotland; but these are left for notice in a subsequent issue.

Mr. Carpenter opens his report with some statistics in regard to the works now registered under the Alkali Acts in England, Ireland, and Wales. They number 1068, compared with 1040 in 1904. Of these, only 73 are works decomposing salt, and so scheduled as alkali works; the remainder carrying on processes which are scheduled, or are subject to registration, under the Acts. These numbers show an increase of 28 scheduled and registered works as compared with 1904. There are also 137 works registered in Scotland; bringing up to 1205 the total number of works registered in the United Kingdom. The number of separate scheduled and registered processes under inspection last year was 1481, compared with 1451 in 1904. Mr. Carpenter remarks that while the number of works registered shows a greater increase than for several years past, that of the separate processes has increased in still larger measure. This is specially noticeable in the case of sulphate and muriate of ammonia. The inspectors paid 5315 visits to works, and carried out 5137 tests, compared with 5053 visits and 4808 tests in 1904. It was found necessary to take proceedings in one case for recovery of penalties, under section 8 of the Act of 1881, against the owner of certain works for allowing escapes of acid gases evolved in the manufacture of sulphuric acid, in excess of the limit prescribed for such discharge into the atmosphere. Infractions of the limits of the Act on two separate days were named in the proceedings in order to mark the gravity of the offence, though the application of the full penalty in regard to these was not asked for. The case was heard in the County Court of the district, with the result that a penalty of £50, with costs, was imposed. In three cases of works found on visits by the inspectors to be carrying on scheduled processes of manufacture without having applied for registration under the Acts, back registration fees were accepted by the Board in lieu of penalties incurred.

In the portion of the report dealing with alkali waste works, Mr. Carpenter remarks that for several years past experimental work on the reactions in the Claus kiln has been in progress, with the object of discovering to what extent the limitations to which the process is subject in practice are essential and fundamental, and how far incidental and possibly removable. These experiments are still being prosecuted, and many facts have been accumulated. But it is not yet possible to say how far reasonable hopes may be entertained of lessening the escape of sulphur in gaseous states of combination. It appears that the manufacturers are fully alive to the importance of the question, and have shown every disposition to prosecute the research through all its intricacies. Trial has been made of another method. It started with the employment of ferrous sulphite as an absorbent; but this reagent "only makes one journey," not being regenerated during the progress of subsequent reactions.

In face of the uncertainty existing as to what might result from working the method on the large scale, it seemed to Mr. Carpenter very desirable, when opportunity offered, to test its effect on the gases from the Chance-Claus sulphur-recovery process, to ascertain, first of all, if the reactions obtained promised a sufficiently satisfactory reduction of sulphur as sulphuretted hydrogen and sulphurous acid; and, secondly, if this proved to be the case, to further investigate the method from the technical commercial point of view, as indicating what might be hoped for in its adoption on the large scale of working. The matter was brought under the notice of the United Alkali Company, who gave facilities for inaugurating and conducting a prolonged series of experiments. The results obtained were of so decidedly negative a character as regarded the first branch of the inquiry, that the questions arising on the second were not considered. A *resumé* of the results, furnished to Mr. Carpenter by the Company, is given, together with particulars of an examination made in his own laboratory by his Assistant (Mr. S. E. Linder, B.Sc.).

Coming to the section of the report dealing with sulphate and muriate of ammonia and gas-liquor works, Mr. Carpenter points out that there was a notable increase in the number last year compared with 1904. The number of processes carried on in these works forms by far the largest contribution to the total of 1481—being 514, or nearly 35 per cent. of the processes coming under the purview of the Acts. With regard to the method of purification by the use of oxide of iron, Mr. Carpenter says opinion continues to be in favour of the application of this material in the form of a conical heap on a concrete floor—the foul gases being introduced below by a simple gas-distributing device—rather than in that of a specially constructed purifier with retaining walls. The occurrence of fouling in the mass is more readily noticeable and more easily rectified; while there is also less labour in spreading the material (when finally fouled) for revivification.

The questions raised in the previous report as to the possible presence of ammonium cyanide in notable proportion in ammonical liquors, were the subject of extensive study during the year. In the report, much attention is given by Mr. Linder to the methods of analysis which Mr. Carpenter says may now be considered as perfected, so that the methods of investigation have been established on firm ground. It is shown that, under certain conditions, ammonium cyanide may be a regular constituent of the liquor distilled. On this subject, the Chief Inspector says:

The presence of this body in notable proportion adds a specially dangerous characteristic to the gases leaving the sulphate of ammonia saturator. Where these are subsequently treated by oxide of iron purifiers, it appears essential to the observance of the "best practicable means" clause for preventing the escape of noxious and offensive gases, and for rendering them harmless and inoffensive when discharged, that some means should be applied to remove hydrocyanic acid. Looking to the ease with which ammonium polysulphide reacts on ammonium cyanide in the ammoniacal liquor itself, with formation of ammonium thiocyanate (sulphocyanide), it would appear a fairly simple matter to ensure that the liquor sent to the stills shall contain no cyanide, by maintaining polysulphide (which can be easily prepared) always in excess. This would, however, require the application of chemical tests. It is true that the skill for conducting these is not always available in this class of work. The difficulty, however, is not an insurmountable one. To state the fact as above is to have taken the first step towards getting the remedy applied. In any case, it is essential to emphatically direct attention to the fact that on distilling ammoniacal liquors in certain classes of works where little storage room exists, so that the liquors are worked off practically as produced, ammonium cyanide is frequently present, and is driven off with other volatile compounds of ammonia. . . . In gas-works where sulphocyanide recovery processes, employing ammonium polysulphide as the active agent, are in operation, the absence of hydrocyanic acid from the saturator gases is ensured so long as the above-named process is efficiently worked, and polysulphide is maintained in excess. Its presence in the saturator gases in gas-works has been found only to be notable in cases where little storage of liquor was possible, or during the pressure at times of maximum make.

In the next section of the report, Mr. Carpenter gives his usual tabulated statistics (for which he acknowledges his indebtedness to manufacturers) in regard to the production of sulphate of ammonia in the United Kingdom. They are—

—	1905.	1904.	1903.
Gas-works	155,957	150,208	149,489
Iron-works	20,376	19,568	19,119
Shale-works	46,344	42,486	37,353
Coke-oven works	30,732	20,848	17,438
Producer gas and carbonizing works (bone and coal)	15,705	12,880	10,265
Total	269,114	245,990	233,664

Referring to these figures, which he says certainly "deserve and repay study," Mr. Carpenter points out that the most important contributor still remains the gas industry. The figures for last year show a substantial increase, which has taken place principally in the manufacturing districts of the Midlands and the North of England, where, as mentioned in the previous year's report, stagnation of trade had been one of the causes tending to check increase of gas output. The next subheads following gas-works in the table show the produce from coal used in blast-furnace operations (in iron-works) and from shale used in the production of paraffin oil. The latter industry is confined to Scotland; the former almost entirely so. Further reference to these classes of works is made in the report to the Secretary for Scotland. The most notable development in England and Wales is the rapid extension of the application of ammonia recovery to coke-oven plants. The anticipated increase of extension in 1905 shows itself in the table in very marked degree. As a considerable number of new plants will be ready for operation during 1906, Mr. Carpenter says the rate of increase does not appear likely to diminish one. As regards the last subhead, the increase arises entirely from the operation of producer-gas plants, the number of which continues to be added to. In contributing to this increase, Scotland has had a considerable share.

Mr. Carpenter next passes to the subject of the constitution of ammoniacal liquors. During the past year Mr. Linder devoted considerable attention to ascertaining the distribution of the cyanogen compounds in ammoniacal liquor; the work being largely directed to the investigation of the conditions under which ammonium cyanide is a notable product in these liquors. The presence of hydrocyanic acid among the gases from the sulphate of ammonia saturator is, as already mentioned, a feature that may attain serious importance. Since, however, ammonium polysulphide and ammonium cyanide cannot co-exist, a ready means seems to be available for rendering the volatile cyanogen constituent innocuous. The results of many analyses of the liquors arising from the distillation of coal in closed vessels go to confirm the conclusion arrived at in 1903, that polysulphides are absent from such liquors, since in one case—that of a gas liquor taken from an exceptionally large store-tank in the summer months—has ammonium cyanide been found absent, having been converted entirely into thiocyanate. Moreover, as shown in former reports, sulphite and polysulphides are in the same way mutually exclusive. If one is present, the other cannot be. The interest this year chiefly centres in the liquors from coke-ovens, where carbonization of coal in bulk is carried out on a very extensive scale. Considerable differences exist in the plant as compared with that in gas-works, and these are reflected in the results of the comparative analyses. Mr. Carpenter thought that Mr. Linder's work would possess interest for those who are engaged in processes for cyanide recovery, where a sulphocyanide is the compound desired; and he asked him to summarize and present the results, which are given in the report. He expresses his appreciation of the skill and zeal displayed by his assistant throughout the whole investigation, which was undertaken largely at a time when circumstances prevented his chief taking any active part in the work.

Mr. Linder also furnishes a valuable memorandum in regard to the conditions affecting the formation of ferrocyanides in sulphate of ammonia saturators. Mr. Carpenter explains how it originated.

At the staff meeting of inspectors in October, an interchange of views was sought for on the conditions under which the sulphate of ammonia, after being fished from the saturator, acquires a blue tinge, in some cases to such an extent as to render the product unsaleable. It was known that the immediate cause was the concurrent presence in the saturator liquor of a salt of ferrous iron and a ferrocyanide. The presence of ferrous iron might arise from a variety of sources; but it was not so easy to account for the presence of a ferrocyanide, In the first place, the analyses of ammoniacal liquors from gas-works – presented now for a considerable number of years in these reports— have shown that it is extremely rare to meet with this body in conspicuous amount in the liquor to be distilled; yet the current belief among manufacturers on the efficacy of good anti-priming devices in preventing the formation of "blue salt" has found widespread acceptance, and may be taken as typical of general experience. Anti-priming devices are of value; but the influence of priming on the occurrence of "blue salt" is an indirect one, if no ferrocyanide exists in the liquor to be distilled. Mr. Linder applied the experience and knowledge gained in the course of the investigations recorded in the previous pages directly to the elucidation of the points left much in doubt at the close of the staff meeting, and as standing in need of further observation and study.

Mr. J. W. Young, the Sub-Inspector for the North of England district, in which so much of the development of coke-oven works has taken place, collaborated with considerable zeal in the accumulation of the observations and in getting the samples required for analysis; while Mr. F. Napier Sutton, who surpervises the Eastern and South-Eastern district, co-operated most heartily with Mr. Linder in the conduct of the experiments at the East Greenwich works of the South Metropolitan Gas Company. To the Directors and Managers of these works Mr. Carpenter tenders his cordial thanks for providing facilities for the investigation detailed by Mr. Linder.

The rest of the report deals with salt, arsenic, and zinc works; and Mr. Carpenter concludes by recording his appreciation of the assistance he received from his colleagues during the year, in the closing months of which, and in the early months of 1906, he was much disabled by illness from taking an active part in the administrative duties devolving upon him. Additional responsibilities, therefore, rested upon the District Inspectors. He specially mentions the services rendered by Mr. Linder, whose valuable research work in the laboratory he fully recognizes.

"Book-Keeping Down to Date."—Towards the close of last year we noticed the publication by Mr. Effingham Wilson of the second edition of a useful little book, bearing the above title, by Mr. Andrew Munro, of Larbert, N.B. The value of the work is shown by the fact that it has now reached its third edition, and this in nine months from its first appearance. The exhaustion of the second edition afforded the author an opportunity of introducing several new features, including an article on cost accounts, and of adding the 1906 Book-Keeping and Accountancy Examination papers of the Society of Arts and the London Chamber of Commerce together with the special feature of fully worked model and unique solutions of the test papers, which will be found of material help and guidance to all interested in the subject of book-keeping. The work has been used by some of the Society of Arts medallists; and it may be conscientiously recommended to all as a practical treatise, irrespective of the business in which they may be engaged.

Wales and Monmouthshire District Institution of Gas Engineers.—As already announced, the next meeting of this Institution will be held in Swansea on the 5th prox. We learn from the programme issued by the Hon. Secretary (Mr. Octavius Thomas, of Pentre) that the business will be transacted in the Gas Company's Offices. The retiring President (Mr. Alderman Canning, Assoc.M.Inst.C.E., J.P., of Newport) will occupy the chair at the commencement, and after the disposal of the routine business will introduce his successor, Mr. R. A. Browning, Assoc.M.Inst.C.E., the Gas Engineer to the Neath Corporation, who will deliver his Inaugural Address. A paper will be read by Mr. Walter Lister, of Godalming, on "A Dust Preventer for Public Roads." Mr. George T. Andrews will give a description of the Swansea Gas-Works, which will be inspected after the meeting. By the kind invitation of the Chairman and Directors of the Swansea Gas Company, the members will partake of luncheon at the Hôtel Métropole; and in the afternoon, they will visit, by permission of the Swansea Harbour Trust, the new docks now in course of construction.

IRISH ASSOCIATION OF GAS MANAGERS.

Annual Meeting in Dublin.

The Annual Meeting of the Irish Association was held in the Banqueting Room of the Mansion House, Dublin (not the City Hall, as had been announced), on Tuesday last. About sixty members attended, which was as full an assembly as has been witnessed at any of the previous meetings.

Welcome by the Lord Mayor.

The Lord Mayor—the Right Hon. Joseph P. Nannetti, M.P.—took the chair at the opening, and said he had great pleasure, on his own behalf and on that of the Corporation and citizens of Dublin, in extending to the members of the Association a very hearty welcome to the city. He trusted the results of their deliberations would be useful to themselves, and also to the various corporations and the other bodies whom they represented. In the present age, when electricity and other kinds of lighting were so much in evidence, it was only right that they as gas managers, and men who were interested in another branch of lighting, should consult each other and hold conferences such as the one in which they would shortly be engaged, so as to keep themselves thoroughly in touch with the condition of things under which they were living. He was sure, therefore, that the conference which they would hold that day would be productive of much good to themselves individually, and to those in whose service they were. He knew they had a good deal of business to do, and it would be an intrusion on his part to take up their time; so he would content himself with again most heartily welcoming them to the city.

The President (Mr. R. Bruce Anderson, Assoc.M.Inst.C.E., of Westminster) asked the members to heartily accord a vote of thanks to the Lord Mayor for so cordially welcoming them to Dublin. He might inform them that they were indebted to his Lordship's kindness in having the fine hall in which they were assembled placed at their service. The Lord Mayor coupled with himself the Corporation and the citizens in welcoming the Association; and their thanks were due to them also.

The Lord Mayor thanked the members very sincerely for their vote. He said he believed it was owing to a misapprehension that it was understood that they were going to meet in the City Hall. He had not the power to give the right to hold meetings, on his own initiative, in the City Hall. But it was within his own prerogative to allow them to meet in the Mansion House; and they were heartily welcome to do so.

The Lord Mayor then withdrew, and Mr. Anderson took the chair.

Report of the Committee.

The Hon. Secretary (Mr. J. Whimster, of Armagh) read the report of the Committee, who opened it by congratulating the members on the continued prosperity of the Association. They said the annual meetings seemed to increase in popularity, and they had every reason to expect that the present one would be as successful as any of its predecessors. The papers which had been promised for it were of an interesting and practical nature, and should lead to good and useful discussions. Their representative on the Council of the Institution of Gas Engineers reported the faithful performance of his duties in connection with that office. Little of the work of the Council during the past year was directly applicable to small gas undertakings, such as formed the bulk of those represented by the members. They, however, would be interested to know that steps were being taken for making a strong appeal to the Local Government Board for an amendment of the Public Health and Local Government (Conferences) Act of 1885, so that the expenses incurred by members of technical societies in the service of local authorities who attended meetings of these societies might be allowed. It was to be hoped that, if this appeal were successful, it might apply also to attendance at the meetings of the Association. Mr. Airth had been duly elected the District Member of the Council of the Institution for the current year. During the twelve months, death had claimed another of their original members—one who took a deep interest in the Association, and regularly attended the meetings—Mr. D. Williamson, of Clones. The Committee sent a wreath, in the name of the Association, to his funeral.

Financial Statement.

The Auditor (Mr. G. W. Norman, of Dublin) read the abstract of accounts and his report. They showed a revenue, with the amount that was brought forward, of £88, and a balance in hand of £60 16s.

The President moved the adoption of the abstract of the accounts and the report.

Mr. J. G. Tooms (Waterford) seconded the motion, and it was unanimously agreed to.

New Members.

On the motion of the President, seconded by the Hon. Secretary, the following gentlemen were unanimously admitted to the membership of the Association.

Ordinary Members.—Hornby, T., Mallow; Harrison, J. K., Clones; Apted, W. H., Carrick-on-Suir; Spittle, P. J., Bagnalstown; Taylor, R. G., Malahide; Shadbolt, R. G., Grantham; Tully, S. J. B., Kinsale; Gibson, D. M., Rathdowney; Ogilvie, G., Newbridge; Cotton, F. T., Dublin.

Extraordinary Members.—Burrows, S., Liverpool; Spear, C. S., Dublin; Dawson, W. H., Dublin; Fletcher, H., Oldham; Evans, Edward E., Birmingham; Jones, W. D., Bristol; Langran, R. C., Carlow.

Election of Office-Bearers.

The President said the members would remember that it was with reluctance that Mr. Conroy, of Galway, allowed himself to be elected Vice-President last year; and in the interim he had suffered a bereavement in the death of his wife, which was sufficient, he (the President) was sure, to justify Mr. Conroy in concluding that he could hardly undertake the duties of the Chair. They had already expressed their regret to Mr. Conroy. He would therefore now propose for election to the office of President Mr. T. J. Reid, of Ballina.

The Hon. Secretary seconded the proposition.

Mr. J. G. Tooms (Waterford), in supporting the motion, congratulated the Association on the choice they had made. He felt sure Mr. Reid would make an ideal President; and they had, along with this, to recollect the importance of the year in which he was to hold office.

Mr. Reid expressed his thanks for his election. He said he accepted office rather reluctantly, because he might not be able to occupy the position with the dignity which probably some other member would have possessed. However, having taken the office, he would do his best to discharge the duties appertaining to it. He had only to express his regret at the circumstances which had obliged Mr. Conroy to withdraw his name.

The President moved, and Mr. J. Paterson (Queenstown) seconded, that Mr. T. Frizelle, of Holywood, be elected Vice-President.

The motion was agreed to.

The three new Members of Committee elected were Messrs. R. Wilson (Monaghan), C. B. Outon (Inchicore), and W. J. Roberts (Newtownards).

The President said that the Committee were unanimous in recommending that Mr. Whimster should again be asked to accept the office of Hon. Secretary and Treasurer; and he moved accordingly.

Mr. Tooms seconded the motion, and it was unanimously adopted.

Mr. Whimster said he was highly gratified at the members' unanimous acceptance of the nomination; but he would be very glad if some new Secretary would arise to take his place. He had held office for a very long period; and he thought it was time some one else should be getting a share of the honours which were going.

Mr. J. Harrison (Monaghan), proposed the re-election of Mr. G. W. Norman, of Dublin, as Auditor.

Mr. J. Bradley (Athlone) seconded the motion, and it was unanimously agreed to.

Representative on the Council of the Institution.

The Hon. Secretary said it would be necessary for the members to elect a representative on the Council of the Institution of Gas Engineers—not for the current year, but for the ensuing year. Their years did not coincide, and consequently they had to make their election beforehand. He had great pleasure in moving that their President, Mr. R. Bruce Anderson, be elected their representative.

Mr. F. Eustace (Tullamore) seconded; and the motion was adopted.

The President, in returning thanks, said he could hardly express how deeply he felt the honour the members had conferred upon him, as he was a stranger among them, not having had any opportunity of showing what he was made of.

Meetings of the Institution and of the Association.

The President read a letter to him from the President of the Institution of Gas Engineers—Mr. Charles Hunt—in which it was stated that he was doubtless aware that next year's meeting of the Institution of Gas Engineers would be held in Dublin, and it was very desirable indeed that Ireland should be well represented in the list of papers furnished at the meeting. He therefore ventured to ask that some of the members of the Irish Association should contribute papers. Any assistance of this sort, he assured them, would be greatly appreciated. The President (Mr. Anderson) asked the members to bestir themselves, prepare papers, and make as good a show as possible. He hoped that if any single member did not feel justified in carrying out experiments, two or three might collaborate, and give their results. Only that morning it had been suggested to him that three or four might join in a paper. He told Mr. Hunt that he would bring the matter before the meeting, and endeavour to get some of the members to respond. The Committee had considered the question of where their own meeting was to be

held next year; and they were unanimous in the opinion that, on account of the International Exhibition being held in Dublin, the meeting of the Association should take place there. He therefore proposed Dublin for next year's gathering.

Mr. J. E. ENRIGHT (Tralee) seconded the proposition, and it was unanimously agreed to.

Mr. J. BRODIE (Omagh) said several members had expressed the opinion that their meetings were held rather late. The lighting season, with most of them, was just starting, and the winter's work was also beginning. He would therefore move that next year's meeting be held in conjunction with that of the Institution of Gas Engineers. If possible, they might put themselves in the shade for one year, and contribute one or two papers to the Institution meeting, and otherwise take part in the proceedings. They could have one day to themselves, for the President's address and other formal business, and after that combine with the Institution, and try to make a huge success of the combined Associations. He proposed that the matter be left with the retiring President (Mr. Anderson), who was in London, and in touch with the officers of the Institution, and the Hon. Secretary (Mr. Whimster) to arrange. The excursion, if possible, might also be held jointly. If they could do nothing else, they could give a right hearty welcome to the members of the Institution, many of whom would have come across the water to visit them. This motion only applied to next year, and they would then see how the experiment worked.

The HON. SECRETARY thought they could not have their usual meeting next year, because it would clash with that of the Institution; but the suggestion thrown out by Mr. Brodie, which was considered at a Committee meeting the previous night, was a very good one, if the Council of the Institution would fall in with it. The Institution meetings were generally held on Tuesday, Wednesday, and Thursday, with Friday for an excursion. If they were to meet on the Monday afternoon for their President's address, opening their own meeting, then combining with that of the Institution, and providing a paper or two to the Institution meeting—they might meet as one body for the next three days, and see the Gas Section of the International Exhibition, in which, he hoped, they would be well represented. It would be a most interesting gathering, and it would enable the members, to a man, to join in it. There would be so much inducement for them to come, that he expected they would embrace the opportunity; and there would not be a call upon them to attend two meetings, held at different times, during one year. Of course, the Institution might refuse to fall in with the proposal—and, of course, they all knew there were points of divergence between the Institution and the District Associations, which might lead to some objection. But the Institution were asking their co-operation; and he thought this was the best way to afford it. If the Institution raised any objection, it would be for the Committee to try to discover a middle way out of the difficulty.

Mr. T. J. REID (Ballina), as the President for next year, thought it was only fit that he should make a few remarks. So far as the coincidence of the two meetings was concerned, he was at one with Mr. Brodie's suggestion; but he did not think they should call the Association together merely to hear their unfortunate President's address, and then dissolve and amalgamate with the Institution. He thought they should stand on their own feet. Let them help the parent Association as much as they could individually; but he did not think they should dissociate themselves with Ireland, so to speak, and join another Association, especially as they had not been invited to do so. He thought any proposal of this sort should come from the Institution, and they would carefully consider it. They might help the gas profession, which was their whole aim and object, by meeting a day before or a day after the Institution, and letting every member who was eligible attend their meeting, and consider what papers he was prepared to give the Institution.

Mr. J. G. TOOMS thought they, in the South, would be quite agreeable to changing the date of the meeting to one a week earlier; but as to co-operating with the Institution of Gas Engineers, he would like to call attention to the fact that their extraordinary members, who attended their meetings in such numbers, and made the gatherings such a success, would be entirely debarred from taking any part in them. They would not be even allowed to join in the excursion. This, in his opinion, was enough to condemn the proposal. If anything, he agreed with the remarks of Mr. Reid, that the Association was quite competent to stand on its own feet; and if they were going to merge in the Institution meeting next year, he would suggest that their own meeting should be abandoned altogether. A number of their ordinary members had not joined the Institution. He begged to propose that no action be taken.

Mr. ENRIGHT thought they had plenty of energy to carry out a successful meeting of their own; and next year being the Exhibition year, they ought to put forth an Irish effort to make it a grand success, and give a cordial welcome to the members of the Institution who might attend their meeting. He would suggest that it should be held in or about the same week.

Mr. T. FRIZELLE (Holywood) considered that, as a matter of courtesy, to go no further, it was right that they should welcome the Institution when they came to Dublin, and sink any minor opinions they might have.

Mr. BRODIE said he would alter his motion to this—that their meeting should be held contemporaneously with that of the Institution, and that all details should be left to the President, the Hon. Secretary, and Mr. Anderson, who would in due course report to the members what they proposed.

The PRESIDENT pointed out that they might have difficulty in getting papers for their own meeting two months later; and he suggested that if the matter were to be left to a Committee, it should be with powers.

Mr. M. DUNN (Stockton) remarked that the Association was affiliated with the Institution, and by that affiliation the members were entitled to attend all the meetings; moreover, they could all bring their then Chairmen, and the individual members of their Associations, if they liked. The Institution would welcome all the members of the Irish Association, for its doors were open to all. If they were visitors, they would sign as visitors; and if they were members, they would sign as members.

Mr. TOOMS withdrew his amendment and moved a direct negative; but he said that if they would agree to report to the members of the Association, he would withdraw all opposition.

A show of hands was taken for and against Mr. Brodie's motion, and the PRESIDENT announced that the motion was lost, and the meeting would be held at the usual time in Dublin.

Mr. REID, however, rose and proposed that the Committee of the Association be instructed to take such steps as were necessary to welcome the Institution, and further the interests of the gas profession when the Institution came to Dublin next year.

Mr. PATERSON seconded the proposal.

Mr. F. T. COTTON (Dublin) said the occasion would be an exceptional one, and he thought that the meeting should deal with it as an exceptional matter. The Institution might probably not come back to Dublin for twenty, or, it might be, fifty years. They were only coming on account of the Gas Section of the International Exhibition; and he did not think there need be any fear on the part of members as to joining with the Institution, if they were invited to do so. He thought it might be left to the Committee to make the arrangements.

Mr. Reid's proposal was unanimously adopted.

The PRESIDENT then read the letter requesting subscriptions to the Benevolent Fund of the Institution which is being sent out by the Hon. Secretary to the Fund (Mr. Walter T. Dunn), and said it had been considered by the Committee, who had agreed that he should read it.

THE METHOD OF ELECTING OFFICE-BEARERS.

Mr. J. G. TOOMS moved, in terms of notice given—"That the election of new members and office-bearers be carried out by ballot, in the same manner as is followed by the Institution of Gas Engineers, or in such manner as the members may decide."

Mr. J. PATERSON seconded the motion.

Mr. W. H. ROBERTS (Newtownards) moved, as an amendment, that the matter be left in the hands of the Committee.

This was seconded by Mr. R. HARRISON (Monaghan).

The HON. SECRETARY, on being appealed to for his opinion, said the present system of election was not prescribed in the rules, but had merely been a matter of evolution. He thought it was a much simpler one than that followed by the Institution.

It was then decided, by a majority, to leave the matter to the Committee.

THE PRESIDENT'S ADDRESS—PRESENTATION OF MEDAL.

The PRESIDENT then delivered his Inaugural Address, which was given in the "JOURNAL" last week (p. 437).

Mr. G. AIRTH (Dundalk) said he had much pleasure in presenting to the President the gold medal of the Association, which was meant to show the appreciation of the members of the services he had rendered to them.

The PRESIDENT briefly returned thanks for the honour conferred upon him. He said it was the first medal he had ever received. Not on that account alone, but for the heartiness with which it had been given, and the kindly feeling which had animated the members, he should value it very highly.

Mr. AIRTH next proposed a hearty vote of thanks to the President for the way in which he had conducted the business of the meeting.

The vote was accorded by acclamation, and was briefly acknowledged by the PRESIDENT.

READING OF PAPERS.

The reading of papers was then proceeded with. They were: "Some Notes on a Gas-Works Transfer Arbitration," by Mr. J. Brodie, of Omagh; "Ten Years Since and Ten Years Hence—Some Commercial Uses of Gas," by Mr. J. F. Davies, of Manchester; and "Simple Methods of Gas Analysis (illustrated by experiments)," by Mr. S. J. B. Tully, of Kinsale. By arrangement, the first and last papers were taken as read. The papers by Mr. Brodie and Mr. Davies, with the discussions thereon, will be found on pp. 507 and 519.

VOTES OF THANKS.

The proceedings having been somewhat protracted, the President was obliged, in view of his later engagements, to leave the meeting, and the chair was taken by Mr. G. AIRTH, the Past-President.

The CHAIRMAN, at the close of the last discussion, said that at that late hour he would move several votes of thanks together.

He should like the members to pass a hearty vote of thanks to the Hon. Secretary, for the able way in which he had conducted the secretarial part of the business of the Association; to Mr. G.W. Norman, their Auditor; and to the authors of the papers which had been presented.

Mr. J. KICHMOND seconded the motion, and it was carried.

The HON. SECRETARY, in returning thanks, said he considered they ought to be gratified with the attendance at the meeting. It had been a good meeting in every way. Indeed, he thought they might look upon it as one of the most excellent they had ever had.

The proceedings then terminated.

THE DINNER.

In the evening, the President and Mrs. Anderson entertained the members and a large number of friends, including ladies, at dinner in the Dolphin Hotel. Mr. ANDERSON presided; and he was supported by the Right Hon. the Lord Mayor of Dublin.

The PRESIDENT proposed the toast of "Prosperity to the Corporation of Dublin," coupling it with the name of

The LORD MAYOR, who replied in an eloquent speech of some length, and concluded by proposing "Prosperity to the Irish Association of Gas Managers."

Mr. T. J. REID, the newly-elected President, responded.

Mr. F. T. COTTON proposed "The President," who, in reply, stated that he had received a telegram from his father, now 85 years of age, but still taking an active interest in gas affairs, wishing success to their meeting.

Mr. A. MACKENZIE (Edinburgh), on behalf of the members and the lady friends of the Association, presented Mrs. Anderson with a gold Tara brooch—an article of Irish manufacture, which, he said, was given as a love-offering.

The PRESIDENT, on behalf of Mrs. Anderson, feelingly expressed his thanks for the gift.

A number of other toasts were given; and there was, as is usual at the dinner of the Irish Association, a long and excellent musical entertainment, provided chiefly by members of the company. As in former years, it was organized and superintended by Mr. G. W. Norman.

EXCURSION TO GLENDALOUGH.

On Wednesday, a party of about a hundred ladies and gentlemen went on an excursion from Dublin to Glendalough, County Wicklow. It began with a railway journey to Rathnew, followed by a drive of sixteen miles to Glendalough, which was varied by a walk through the Devil's Glen. Lunch was had at Glendalough; and on the return journey the party drove to the railway station at Rathdrum—a distance of eight miles—through the Vale of Clara. In the course of the day, the excursionists passed through some most beautiful scenery, which was highly enjoyed. Tea was served at Rathdrum, after which, to remedy an omission in the proceedings of the previous evening, Mr. A. Mackenzie, of Edinburgh, conveyed to the retiring President (Mr. Anderson) the heartfelt thanks of all present for his hospitality and his kindness to the Association. With this graceful act, the proceedings of the 1906 meeting came to an end.

A Large Conduit in Ferro-Concrete.

The largest conduit ever designed in reinforced concrete is now being built to convey the waters of the Ouseburn for a distance of 700 yards along the bottom of the valley between Newcastle-on-Tyne and the suburb of Heaton, so as to permit the Corporation to fill up the valley, and utilize part of the site so gained for the construction of much-needed highway communications and the remainder as building land. Under normal conditions, the Ouseburn is a comparatively small stream; but in times of heavy rainfall it is liable to sudden and severe floods. Consequently, the new conduit had to be designed of the most ample size, and of very great strength, so as to support the weight of earth, to the depth of about 100 feet, which will be filled in above its crown. Having considered various alternative methods and materials of construction, the City Engineer decided to adopt the Hennebique system of ferro-concrete. The Ouseburn conduit is of parabolic cross section, with the height of 22 feet, and the maximum width of 33 feet, providing an internal area of about 584 square feet, or nearly ten times that of the largest sewer channels used in the Metropolitan main drainage system. Notwithstanding its great size and the enormous load of earth and houses it will ultimately have to carry, the conduit is only 8 inches thick at the crown—a dimension that affords some clue to the economy of ferro-concrete as compared with ordinary masonry construction.

The Home Secretary has appointed a Departmental Committee to inquire into the dangers attendant on building operations, and to prepare draft regulations embodying the precautions which may in their opinion be desirable to ensure the safety of the workers. The members of the Committee are: Mr. W. D. Cramp, I.S.O., Deputy Chief Inspector of Factories (Chairman); Mr. J. Batchelor, Operative Bricklayers' Society; Mr. E. T. Jessup, Amalgamated Society of Carpenters and Joiners; Mr. W. Shepherd, London Master Builders' Association; and Mr. A. R. Stenning, Surveyors' Institution. The Secretary is Mr. Leonard Ward, of the Home Office.

NOTES ON A GAS-WORKS TRANSFER ARBITRATION

By JAMES BRODIE, of Omagh.

[A Paper read before the Irish Association of Gas Managers, Tuesday, Aug. 14.]

During late years, the question of municipalization is one which has afforded many a bright discussion, both within and outside the council chamber. Advocates have arisen calling out for municipal baths and washhouses, dairies and bakeries, gas and water works—in short, anything that will tend to reduce the rates (by first increasing them). Of the many departments, the gas-works seem to be the one of the coveted undertakings which at all times, and in almost all circumstances, has the best chance of recouping its purchasers, provided that it is properly managed and financed. But, unfortunately, the existence of the gas department's till is often answerable for much municipal extravagance. Its profits are too often used to bolster up some other consumptive undertaking, instead of going to the benefit of the gas consumers in the shape of reduced charges for the commodity. However, these are matters which in time may be rectified; and when that time comes, I trust the consumers, wherever the gas-works are owned by the local authority, will find themselves supplied with a satisfactory quality of gas at as low a selling price as is consistent with local conditions. It is not my intention, however, to enter into the "why" and the "wherefore" of municipalization, but to give a short cursory glance at the proceedings leading up to the transfer of the Omagh Gas-Works to the Urban District Council.

In 1901, the Omagh Gas Company promoted a Bill, and applied to Parliament for sanction to have the undertaking incorporated as a Statutory Company. This proposal met with a great deal of opposition on the part of the then Urban District Council and the townspeople generally. Public meetings were held protesting against the Company's proposals; and both locally and in Parliament the action of the Company was severely criticized. Ultimately, the Company gained the day by the narrow majority of 14 in the House of Commons; but they did not get off quite scot-free, as a clause had been inserted in their Bill to the effect that the District Council could, within the next three sessions of Parliament, promote a Bill for the purchase of the undertaking as a non-statutory one. This clause was given effect to the following year; and the Council obtained their Act, enabling them to purchase the works and undertaking of the Gas Company either by agreement or arbitration. The latter was the course they decided upon.

The Board of Works for Ireland being, under the terms of the Act, the nominators of the Arbitrator, appointed a gentleman well known in engineering circles—viz., Mr. Joshua W. Edmundson, of Dublin; and April 5, 1904, was the date fixed for hearing evidence. The proceedings were held in the Court House, Omagh. Counsel for the Company, in his opening speech, gave a short *résumé* of the history of the undertaking, and then dealt with the difference between a statutory and a non-statutory company. He held the view that the principal right of a statutory gas company was their power to open the streets; other rights, such as the fixing of the dividends, &c., had been largely done away with owing to the general adoption of the sliding-scale. In his examination of one of the Company's witnesses, this was very clearly shown in the following words: "The difference between the value of a statutory and a non-statutory company lies wholly—practically wholly—in the fact that one has the right to open streets, and the other has not. If a company chooses to go to Parliament for incorporation, it becomes an incorporated company; and I say, therefore, that practically the cost of getting an Act of Parliament for incorporation is the measure of the difference in the value of a statutory and a non-statutory company"—the purchase terms being 28½ years in the former, as against 26⅔ years in the latter case. This opinion was hotly contested by the opposite side, who held that 20 years' purchase was the proper term for a non-statutory company, and 25 years' for a statutory one, though they in turn had to admit that the right to open streets was practically the only difference between the two companies.

Another point in dispute was with reference to the amount chargeable, on the renewals and repairs accounts, for work and mains only. On behalf of the Company, 4½d. and 5d. per 1000 cubic feet were the amounts put forward as being perfectly adequate to keep the works and mains in proper repair; while the purchasers contended that it could not be done for less than 7d. per 1000 cubic feet. On looking over the "Gas World Analysis of Accounts of Gas Undertakings," I find that the former sum of 5d. per 1000 cubic feet is a great deal nearer the average than 7d. However, these are points which are subject to a good deal of argument either way; and I do not intend to do more than mention them.

The valuations as worked out by the Company's experts were £36,304 and £34,805—this price being based on a net maintainable profit of £1286 and £1251 17s. 4d. respectively; while the price placed on the undertaking by the expert for the Council was £15,793, based on a net maintainable profit of £822. The award of the Arbitrator was £26,880, *plus* stocks. Unfortunately, this does not cover everything, as there has to be added, for legal and other expenses in connection with the winding-up of the concern, a large sum, a considerable portion of which has to

be cleared off in five years. The capital of the gas undertaking at present stands at £36,885 16s. 5d.; the make of gas being something over 20 millions.

In passing through arbitration proceedings, such as I have mentioned, I need hardly say how valuable is the information to be derived therefrom, which, fortunately or unfortunately, it is not easy to put into words or to disseminate, but which stands in good stead in circumstances comparable to those in which the information was gathered. We have first the appointment of the engineers, next the accountants, and so on. The mass of statistics which have to be gathered before a price can be fixed, shows one how clear is the grasp which the experts have of the work in hand. All this, however, brings one back to the fact that the necessary information must first be obtained from the working of the undertaking; and on these results depends, of course, the purchase price.

To enable the accountants to compile their statistics, there must be a thorough system of book-keeping. This was one thing which struck me most when I took up the duties at Omagh. My appointment, being the joint one of Manager and Secretary, gave me unusual facilities for studying the working of the concern. The system in vogue is that of Brearley and Taylor, and though, on its face, it appears rather complicated, after a little intelligent study and working I hardly think that any person who has once adopted it would wish a change. I hold no brief for the authors; but I would strongly recommend my fellow-managers to study the method for their own benefit. I think I can hear some one say: "It would be of no use to me, as I never get a chance of seeing my company's books." Well, the more's the pity for the company or the council. If a committee have sufficient confidence in a man to appoint him as manager of their works, surely the more intimate he is with the financial side of the undertaking the more interest will he take in its advancement and development. Many managers of works are unfortunately kept too much in the dark regarding the profit and loss account, &c., and are not exactly treated as they should be. Personally, I feel that the results obtained at Omagh in connection with the arbitration were greatly due to the confidence reposed in the management and staff by the former Directors, which confidence, I am glad to say, is still retained by the present Committee of the Urban District Council.

Discussion.

The PRESIDENT (Mr. R. Bruce Anderson) said he thought the subject Mr. Brodie had dealt with was of supreme importance to the whole of the members. It seemed to him that it was only a matter of time when all gas-works would be taken over by municipalities; and the more they knew about transfers, and the manner in which they were conducted, the better it would be for them.

Mr. J. RICHMOND (Kilkenny), while appreciating Mr. Brodie's paper, considered that if he had given some details as to the various means by which the experts arriving at these conclusions, instead of giving only the sum they arrived at, the information would have been more valuable. To his mind, the difference between the two classes of experts mentioned was enormous; it was fully 50 per cent. There must have been some discrepancy between the methods of arriving at valuations, or else some serious blunders. There was something amiss; and if they had had details, these would have gone a long way to add to the value of the paper. In the case given, the actual capital and the legal expenses worked out at fully £1800 per million cubic feet of gas made. This was something enormous, and it would be a heavy tax upon consumers. The President had mentioned, as a fair average, £800 per million. Here they had a tax of £1000 in excess of that; and after this they had interest and redemption of loans to provide for. He feared Mr. Brodie would be severely handicapped for a long time in the matter of the price of gas.

Mr. E. YOUNG (Youghal) asked what would be the expense of the Provisional Order mentioned.

Mr. G. AIRTH (Dundalk) thought the paper was an excellent one all through; but the portion which deserved the most praise, in his opinion, was the last paragraph. He agreed with it. Fortunately, the Company whose undertaking he had the honour of managing were everything that one could desire. The accounts all went through the Manager's hands, and he knew before his Directors what profit was made. He thought that if a company were going to Parliament for an Act, or were compelled by the local authority to do so, if the manager were a good man he was the best witness they could call, because he would have all the figures at his fingers' ends, or, if he were troubled with a bad memory, in black and white. The Dundalk Gas Company went to Parliament in 1887; but they first approached the Local Authority, and told them they wanted to do the thing amicably. The Local Authority wished the Company would sell the works to them. The capital at that time was £22,000; and the Company were willing to sell for £33,000. The Urban District Council thought this was an exorbitant price. The Company appointed Mr. G. W. Stevenson as their consultant in the matter; and the Council had Mr. R. P. Spice. The claim by the Company, when it went forward to arbitration, was for £49,706; the sum offered by the Council was a little over £19,000. The Umpire was Mr. John Clutton—another gentleman well known in the gas industry; and he made his award at £47,791, which included somewhere about £1280, which was the cost of the Act. Besides, the Council were allowed only six months in which to purchase the undertaking; and they had to pay for stocks, and the cost of a photometer which had to be fitted up under the Act. These were figures which might have been put out of sight: but his Directors laid them before him, and told him to do anything he liked with them. He thought if a manager could stay with a company it was better for him, because under a corporation he did not really know how many masters he had. All the managers who were under companies should, he thought, pray earnestly that they might long remain so.

Mr. W. H. ROBERTS (Newtownards) remarked that, being the Gas Manager for an Urban District Council, who acquired the works in 1880, it might possibly be worth the while of the members to have a few figures from him, to compare with those of Mr. Brodie. The transfer was affected by agreement, and worked out at 16⅔ years' purchase; and he was surprised, when he looked into Mr. Brodie's figures, to see that in Newtownards the capital raised was only £2123 per million cubic feet of gas. No one could deny that it paid the Council to acquire the gas-works. In Omagh they got the works for £1849 per million. Mr. Brodie seemed to look for brilliant prospects for the gas undertaking. He (Mr. Roberts) would just like him to consider whether the concern was likely to cover the capital expenses, with redemption of loan and interest. If it did so, and taking the circumstances of Newtownards as against it, he really did not think the Omagh transfer had been as exorbitant as had been pointed out. In 1880, the price of gas in Newtownards was 7s. 6d. per 1000 cubic feet; and in October next it would be reduced to from 2s. 10½d. to 2s. 6d. for ordinary consumers, and to from 2s. 3½d. to 2s. 0½d. for trade purposes. When compared with prices in other towns, he thought the consumers had reason to be thankful. Calculated on the basis recommended by the President, on the average receipts, the price would be 2s. 7½d. per 1000 cubic feet. His opinion was that if Newtownards could be accepted as a sample of the basis on which transfers were taking place, they were really not getting half what they should do in the prices paid by local authorities to companies.

Mr. T. J. REID (Ballina) said, when he heard that Mr. Brodie was to give a paper on the transfer of gas-works, he thought he would be able to get information which would be useful to him. He was, however, rather disappointed in the paper. The author had been surely at considerable trouble to conceal the information he wanted. No doubt he had his own ideas when he withheld this information; but possibly he might give it to them when he was replying to the discussion. He certainly hoped he would, because he would like to know the exact cost of the transfer of a company, how it was allocated, and the procedure necessary to get it. So far as he was concerned—and probably there were others like himself—he was in absolute ignorance as to what to do, and how to go about it. If Mr. Brodie could give him the information, he would be much obliged to him. In the transfer of gas-works, it seemed that the only benefit to be had from obtaining a Provisional Order beforehand was the actual amount of the cost of getting the Order. If this were the case, then what was the good of getting an Order? If they were selling to a local authority, it should not give them any more money.

Mr. G. LENNON (Dungarvan) would like to know what the share capital of the Omagh Gas Company was previous to the transfer, and if it were necessary for the Urban Council to increase the price of the gas; and also what the price of gas was before the transfer took place. Another thing he was very anxious to know was how local bodies under Act of Parliament made out their abstracts of accounts, because he had been speaking to several people, and nobody, he might say, could tell him what the profits of gas-works in Ireland managed by urban councils were. He would be very much obliged if any manager working under a district council would let him know how the profit and loss of a gas undertaking worked out. The amount of £26,880 appeared to be a very excessive figure to give for works making 20 million cubic feet. He did not suppose that the structural value of these works was anything like this amount; and he was sure that a works which could turn out 20 million cubic feet of gas per annum could be erected at the present day for somewhere about half this figure. The only other advantage to the Urban Council was the goodwill of the Company; and he really did not see how this could amount to the difference between 20 years' and 28 years' purchase.

Mr. T. FRIZELLE (Holywood) considered that the only benefit a company got by procuring a Provisional Order was that they could open and close the ground; it did not place them in any better position. So far as he could see, the difference between what it would take to get powers to do this, and to bring up a non-statutory company to the same value as a statutory company, was this power. He managed a gas-works for a Company, and they had come to terms with the District Council with regard to the opening and closing of the ground. The terms were that the Company paid 5s. to the Council when they asked liberty to open the ground. This 5s. was returned to them after twelve months, when the road had been consolidated. Therefore, he did not think it would pay his people to go in for an Act, seeing the opposition they would get from the Council. And looking to the Pontefract case, he did not think it would pay for them to go in for an Act, when they could come to terms with the Council for the small sum named. It cost the Omagh Council £37,000 for their works—works which turned out 20 million odd cubic feet a year. This was a big sum to pay. If the question of cost were made public, it would help to deter councils from entering into litigation

with companies which owned gas-works; and it would also cause them to come to terms, because all they could get, if they went to Parliament, was power to purchase. If it cost a small town £37,000 to purchase a gas-works turning out 20 million cubic feet, the ratepayers could not expect to get gas any cheaper than the company would be supplying it to them—in fact, they would be obliged to increase the price, so that they might be able to pay back the loan in a number of years.

The PRESIDENT said that several of the speakers had dwelt on the question of the manager having secretarial duties as well. He thoroughly endorsed what had been said. In the first place, in amalgamating the two offices, they would have the one office paid on a much higher scale than could be in the case of either of the offices separately, and they would get a better man. No one was better qualified to give good advice to a Board than the man who understood the figures; and the manager was the man who understood the figures, whereas the secretary did not, but merely knew the outcome which was put before him by the manager, and did not know how the figures might be transmogrified before they reached the balance-sheet. They should congratulate Mr. Brodie upon having done so well by his employers; and he had no doubt the Council would be satisfied that the man who did so well for one set of employers, would most likely do equally well for another set. Mr. Brodie had been reserved in the information which he had given them. He, too, looked forward for some such information as Mr. Reid had tried to get from him; and he hoped that he would give them some particulars as to his experience of the class of work he had to get through. He might enlarge upon what Mr. Frizelle had said with respect to the value of the concern being enhanced by the cost of getting the statutory powers. He did not think Mr. Frizelle was quite right in that. The value of a concern was enhanced by a great deal more than the £300 which it would cost to get a cheap Order. The cost of getting an Order might be as low as £300; but the cost of acquiring statutory powers by Act of Parliament would certainly not be less than £1000. The cheapest he ever heard of was £800; and it might run into thousands of pounds. All the umpires took into account, not the average cost, but a fairly big price, on getting an Order; and hence they struck it at from 26¾ to 28½ years' purchase as the respective values for the two classes. If they could come to terms with the various local authorities, and get a cheap Order, which might only cost £800, their expenses need not be increased; but if, on the other hand, they made application for an Act of Parliament, their expenses might amount to £3000. Accordingly, in his opinion, and as Mr. Frizelle had said, it might not be worth making the application. The best thing was to offer their works to the local authority on arbitration terms; and the experience of Omagh would stave off a good deal of acceptances of such offers, and by the time they could come to terms (reasonably, of course), the Company could go to the Board of Trade and get their Provisional Order.

Mr. BRODIE, in closing the discussion, said he knew only too well what he had worked out; but it was a subject which, if it were gone into in detail, would keep the members there all day. The difficulty was to keep on the top, and not to dip too deeply. Mr. Richmond asked for details of the method of arriving at the prices. There were a great many things tied up in that simple request. But the profits, after the balance of the profit and loss account was arrived at, were adjusted to what would be reasonable—such as the amount required for repairs to the works. Perhaps more might be allowed in one year than was necessary, and there might, on the other hand, be expenditure in one year which would not occur again for (say) the next five years. This, of course, would be adjusted so as to bring out an equality over the five years. This was the condition over all the departments; and it then came to be a question as to what was the proper average of profits to take. The Company's experts held that the last year was a sufficient guarantee of the amount which might be expected to be put to the profit on the works. They considered that the business had been proved, from the start in 1850, to be a progressive one, and that, consequently, there was no reason to think that it would not be progressive in the future. The opposition claimed a five years' average. They said there was no guarantee that the works would be progressive. There was no reason to think that somebody might not turn up to put in electric light, or that some might not go in for acetylene gas lighting, and thereby a large asset might be cut off. Their award of £26,880 worked out at 21 years' purchase, which they considered was a fair price to be obtained; and he still thought that if they had nothing else but the award to meet, the works were still value for the money. The works were in good condition, and they had a really good business; so he did not think that the town paid too much. Unfortunately, the Bill was opposed by them in Parliament; and the costs of the opposition, he thought, were about £2500 in the obtaining of the Act alone. The total came out at, possibly, about £8000 for the legal and other expenses in connection with the winding-up of the Company. So that he thought this was quite sufficient to put anybody off purchasing gas-works at the present time.

The PRESIDENT: Can Mr. Brodie tell us the profit per 1000 cubic feet the Company were making, and the cost per 1000 cubic feet which the Council will have to pay, in interest and for redemption? Has it increased, or has it been reduced?

Mr. BRODIE was sorry he could not give the figures off-hand. The cost into the holder, in the Company's time, he believed, was, in round figures, 2s. This was works expenses, keeping out rates and taxes; and it was under that now. It had been reduced about 4d. per 1000 cubic feet, he thought, at the present time. A certain amount had to be paid off by short loan. The Council's own expenses had to be paid off in five years; and so, if these were paid off, he did not think they would be in a very bad condition. If it were not for this requirement to pay off in five years, he thought they might manage to stave off things fairly well. Mr. Young had asked about the expenses for the Order. This, he thought, had been given. It was an Act of Parliament they had, which cost a great deal more than a simple Provisional Order. If it had been unopposed, it might have been got for about £1000. Mr. Airth had supported his statement that the manager should know all details about the profit and loss account. This was a matter which should be impressed as strongly as possible upon all committees. He had been in a position himself where he could not see the books at all. It placed a man at a very great disadvantage—in fact, it took the heart out of him altogether—not to know what was being done, or what he was doing. It meant that, if they could know what was actually going on, day by day, they could compare the returns from residual products, or the quantities of gas made—in short, everything in connection with the department was at their command, under the system of book-keeping which he had mentioned; and it gave a man far more heart to work. He sincerely trusted that this might yet come more and more to the front. As to the joint office of manager and secretary, in all large works the manager should certainly have the supreme authority. Mr. Lennon asked about the capital of the Company. Well, the works were built up out of profits; and they were valued at the time of the arbitration, on behalf of the Company, at £18,000. This was the money which was really invested in the works, in hard cash. Of course, they could not say what the original capital of the Company was, seeing that so much more money had been invested in it. He also asked how the profit and loss account was made out. He could not do better than refer him to Brearley and Taylor, whose book gave one an excellent grip of all the incidents of gas-works book-keeping. The cost of the erection of gas-works to produce 20 million cubic feet might really be less than £25,000. Mr. Hunt had finished a works for £14,000. With regard to Mr. Frizelle's remarks, there was no doubt that the power to open and close the streets was practically the principal power which was vested in a statutory company. They had other powers, which meant a great deal, but it was fixed down to that really, as the mainstay of their Act of Parliament. If the Company had been still occupying the works in Omagh, the price of gas would now have been very much reduced. As it was, they could not effect a reduction for a good many years to come, although they had reduced the price for power purposes to 3s. 9d., with discounts which brought it down to 3s. 2d. The ordinary price was 4s. 6d.

"Fowler's Architects' and Builders' Handbook."—We have received this book from the Scientific Publishing Company, Manchester. The author does not pretend that his work is a text-book on any particular branch of the building trade, but merely a synopsis of practical rules, tables, and data specially compiled for the use of architects, builders, plumbers, painters, decorators, and students in technical schools. The contents, however, occupy 500 closely-printed pages; the subjects dealt with including lighting, heating, and ventilating arrangements, water supply, sanitation, &c. They are arranged in sections, and there is a copious index. The work is of convenient size for the pocket, and it is to be had in cloth or leather binding, at 2s. 6d. or 3s. 6d.

"New Business Methods" for 1907.—Readers of the "JOURNAL" have already become familiar with the book bearing the above title, prepared by Mr. George Williams, of Madison (Wis.), U.S.A., for the Ohio Gaslight Association. It was so successful that, as mentioned last week, he has been requested by the new American Gas Institute to furnish a similar report at their first annual meeting, which is fixed to be held in Chicago in October. Though similar, the work will be published in much better form than its predecessor, and is intended to be a useful book of reference for new business work. As will be seen from an announcement which appears elsewhere, contributions are invited from gas managers in this country; and should any of our readers be disposed to assist Mr. Williams, perhaps they will communicate with him, either at the above address or at No. 60, Wall Street, New York, as soon as possible.

Manchester District Institution of Gas Engineers.—As already announced, the next quarterly meeting of the Institution, which will be held at Ilkley on Saturday, will be devoted entirely to pleasure. We learn from the programme issued by the Hon. Secretary (Mr. Henry Kendrick, of Stretford) that on the arrival of the members, who are invited to bring ladies with them, carriages will be in readiness to convey them and their President (Mr. J. H. Brearley, of Longwood) to the gas-works; while the ladies will walk through the town, under the care of Mrs. Brearley and the local members' wives, to Wells House Hydro, where luncheon will be provided by the Ilkley Urban District Council. At its conclusion, the party will drive, *viâ* Nessfield, to Bolton Woods and the Strid. Afternoon tea will be served at the Strid Cottage, and high tea at Lister's Arms Hotel, Ilkley. Given fine weather, the excursion should be a delightful one.

LABOUR-SAVING MACHINERY FOR MEDIUM-SIZED RETORT-HOUSES.

By F. H. SHELTON, of Philadelphia.

[A Paper presented to the Western (U.S.A.) Gas Association.]

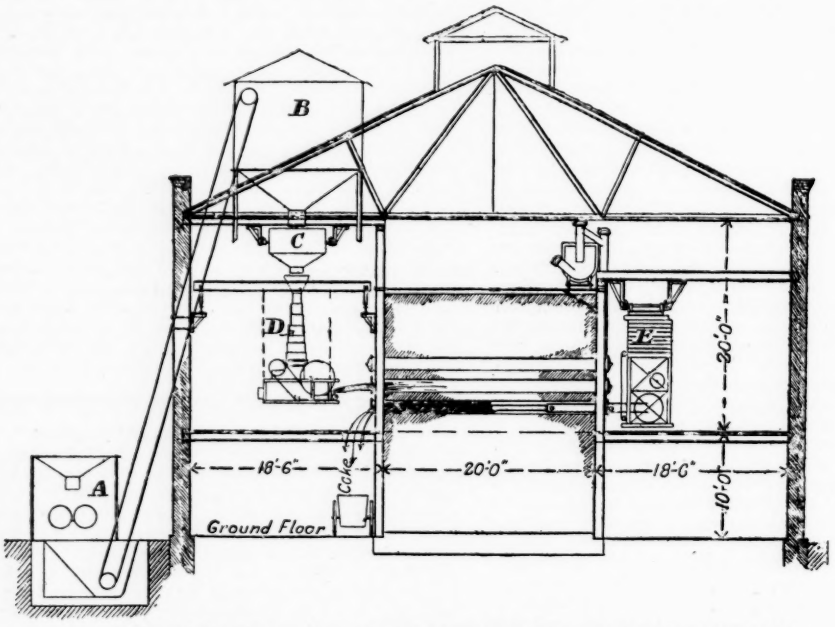
It is doubtless a fact that many gas companies of medium size, manufacturing coal gas, would like to get away from the ordinary hand labour, and upon a machine charging and discharging basis, but are deterred by the heavy expense usually considered as necessary in so equipping retort-houses. Having recently had this question before me in connection with two or three companies of but moderate size, and having worked out an arrangement that seems to me to give a great majority of the advantages desired, and yet without excessive investment, and at a cost permissible for such companies, I would briefly describe such an arrangement for the convenience of those who are interested in the question.

The fundamental steps necessary for doing away with hand labour and getting greater quickness of working and greater capacity per man, may virtually be taken as: (1) Some mechanical means for lifting the coal to the highest point required in the retort-house; (2) some convenient and certain method of weighing the coal as it passes into use; (3) some form of power machine for putting it into the retorts; (4) some form of power machine for pushing the resulting coke out of the retorts; and (5) the question of the best form of conveyor. The last, however, for taking away the coke, is one that is so complex and difficult to solve, and varies so with local conditions, that I shall not dea with it.

It should be remembered that all the above equipment must be of simple type, not liable to get out of order, easy to operate, and moderate to instal. An installation recently completed, illustrating the above, is shown in the accompanying illustrations, and may be described as follows.

Wherever the coal may come from, it is brought from the coal-stores or incoming cars to the retort-house at the ground level, and is dropped through a crusher A to take out the large lumps, and to make it of the best size for whatever charging-machine may be used. An ordinary and simple bucket elevator lifts the coal from the boot of the crusher to an overhead bin B carried on a trestle support outside of, and against, the gable end of the retort-house. This bin is arranged to hold enough for 24 hours' supply; so that, being refilled towards dark, there is no occasion to handle coal in the yard, nor operate the conveyor during the night shift. This capacity also enables adjustment and repairs to be easily made to the conveyor, if need be, between its working periods. This bin at the roof level may be called the "daily feed bin." In the case shown, the coal falls from it by gravity through a shoot into the inside of the retort-house, and enters the weighing-hopper C. This hopper holds enough coal to charge three retorts without refilling; and after being loaded, it is pushed opposite the retorts to be charged. In this arrangement, therefore, the hopper travels backwards and forwards as it requires more coal.

In another arrangement, a continuous bin, running the length of the retort-house, is used instead of the outside overhead bin shown in the illustration; and in this latter plan a coal-gate is



Suggested Arrangement of Labour-Saving Machinery for Medium-Sized Gas-Works.

provided underneath in front of each vertical tier of retorts, so that when coal is drawn for charging it falls directly into the weighing-hopper, and after the weight is noted it further falls, as required, into the charging apparatus. The overhead bin may be of sheet-steel construction, or even of 2-inch plank, bound with angle or T-irons at the corners, and tongued and grooved to prevent dust leakage. The discharge shoot, however, should be of steel in either case. The weight of the overhead bins is easily carried by extending the bench buckstaves and throwing I-beams across to the retort-house wall.

The continuous bin form should preferably be outside of, and just above, the roof (the shoots passing through), as it can easily be protected from the weather by a light canopy above; and it is far more accessible and convenient to reach by walking along on the roof than by having to get at it under the roof if crowded in the dark and dusty space in the trusses. This, moreover, leaves the full height from the ground to the truss line unencumbered and free for the weighing and charging apparatus.

The weighing-hopper is a special design, built to order, to hold any ordinary quantity desired. It is of sheet steel, mounted on the necessary platform scale-weighing apparatus, which is mounted in turn on a track, and should be provided with a gate underneath to control the flow of coal. The scale-beam, in the instance I have used, is carried down on a light framework, so as to be opposite the head level of the operator, to easily enable accurate weighing. This beam, moreover, is so made in triplicate form that weights can be set at desired points, so that when the proper amount of coal has fallen out, in charging one retort, the beam will "kick up," as a signal to the operator to shut off the coal until the next retort is in readiness for charging. This weighing-hopper is supported on tracks on the under side of the I-beams that carry the overhead bin.

The charging apparatus D, is of the De Brouwer projector type; but it may, of course, be of any pattern desired. Whatever the pattern, it should preferably be carried on an overhead travelling carriage running on rails, mounted on brackets on the wall of the retort-house, and on the buckstaves, thus avoiding floor rails or any trucks resting on the floor. Floor tracks are bad, as they catch dirt, cause tripping, rust from water, are more apt to get out of line, and require stronger floor-beams.

The discharging apparatus E, in the instance shown, consists of a telescopic ram carried in a travelling frame mounted on a truck running in channel-irons that form a track the length of the retort-house, suspended on the under side of I-beams reaching from the rear buckstaves to the retort-house rear wall. Incidentally, these I-beams make a very convenient platform base for getting at the ascension pipes and the hydraulic main, and for hoisting mouthpieces, &c. The coke-pusher, of course, is so constructed as to be easily moved from bench to bench, or up and down in a vertical plane, according to which retort is to be discharged. It is so constructed as to be adjustable for variations in the retort levels, or for different cross sections, and yet be quickly clamped at any point at which it is desired to operate it. The pusher, the projector, and the weighing-hopper should all be provided with ball or roller bearings, so as to minimize friction in travelling up and down the retort-house, as well as with a chain pulley and compound gear, making it easy for a man to propel these parts instead of requiring two or three men to push them by sheer muscular effort.

All the equipment should be operated by electric motors, as

this is by far the most convenient form of power. The coke-ram requires 2-horse power, the projector 5-horse power, and the coal elevator and crusher perhaps 5 or 10 horse power. All these motors, however, are used only intermittently, and the cost of current is very small. I have inclined towards the installation of a small steam-turbine driven electric generator for such work; for while the consumption of steam is not economical under such circumstances, it is one of the forms of electric generators that can be looked after by an ordinary gas-works fireman with little attention, and has but slight chance of getting out of order, as contrasted with the high-speed delicate reciprocating engines. The cost of the steam used, employing breeze for the intermittent work, I have not determined in such a plant; but I do not think it can amount to much.

With an equipment such as that described, I expect two men to a shift to operate several times as many benches as could possibly be covered by hand labour, and in that way to get the return on the cost of the machinery involved. In addition, I reckon an increased operating efficiency from the shorter period the retorts are left open, the more uniform heats, less wear and tear and repairs on the retorts, and less breeze in the coke. The time of charging after the machine is centred and the lid opened on a 10-feet retort is something like 10 seconds; and the time of pushing out the coke and withdrawing the ram is 30 or 40 seconds. With current coming from the engine-room so that the machines can be dependably operated, and with coal brought to the foot of the bucket lift by the outside force, the retort-house men should have great ease of work and capacity per man, and practically none of the old laborious retort-house labour, except quenching the coke and attendance on the furnace fires.

The arrangement shown is for 20-feet retorts, which can be equally well charged and discharged as the 10-feet length. The space required for the charging-machine should be 16 to 18 feet, while the coke-ram should have from 10 to 15 feet, according to the length of the retorts and of the telescopic ram. In other words, for benches with 10-feet retorts, the retort-house should be about 35 to 38 feet wide inside; while for 20-feet retorts, it should be from 55 to 60 feet. It will be noted that 20 feet from the operating floor to the roof trusses is sufficient, and 10 feet to the ground level, giving plenty of space for coke handling below. Yet this only involves a building 30 feet to the truss line, which is very reasonable for a machine-operated retort-house with full-depth benches, &c. As an approximate figure of the cost of such equipment, I would say that in one instance, with 20-feet through retorts and four benches, the cost of the construction outside of the benches, or the coal handling up to the crusher and the coke handling after quenching, was approximately $12,500 (£2500); and in another instance, having eight benches with 10-feet retorts—the benches being set in line, and with a continuous steel hopper in the roof and a somewhat extensive system of conveyors to take the coal from beneath the railroad trestle within a coal-shed about 20 feet distant, and parallel to the retort-house—it was about $15,000 (£3000).

The above equipment is not offered as being justified for very small works, nor as being necessarily the best for a large or for all types of coal-gas plants, but as one specific way of getting upon a machine basis for works of what may be called the intermediate size.

Discussion.

Mr. F. Egner, in opening the discussion, said he held, to begin with, that horizontal retorts were now, or ought to be, obsolete, in the light of the well-authenticated improvements made in gas manufacture of recent years, the results of which were fully described in the gas publications of the past year. He referred to the standing retort system, not to the misnamed "vertical eights," which first came into notice by means of a paper read at a meeting of the American Gaslight Association some years ago, in which they were told "Why Milwaukee Didn't Build Inclines." These standing retorts had come to the front very quickly. They had been thoroughly tried at Dessau and at the Mariendorf works, near Berlin, with the result that a number of works were about to be supplied with the system, among which were the works at Cologne, where 24 benches of such retorts were being erected under contract. The reasons why the horizontal retort should be considered obsolete might in part be understood when one reflected upon the effect of the clear space between the layer of coal or coke in such a retort and the retort roof, and the influence this had on the production—or they should say "destruction"—of ammonia and the thick pitchy tar in the hydraulic mains, when the usual high heats were maintained. There could be no doubt the claims made by those who had tried the standing retort, that they got about double the quantity of ammonia, not thick pitchy, but thin, tar, just as much, and even more, gas, and as much, and better, coke, from like coal, were well founded; and hence these were to be seriously regarded—indeed, more so than stoking machinery. But if they did not care to consider things which had not yet come into America, let them come back to inclined retorts, of which there were certainly a number of installations in operation in various parts of the country. Mr. Shelton wrote of "some form of power machinery for putting it [the coal] into the retorts," and "some form of power machine for pushing the resulting coke out of the retorts." That was all very good if they were going to shut their eyes to the progress of the age, and to continue the use of the old-fashioned retorts. If they were going on satisfied with losing half of one of their most valuable bye-products—ammonia—and keeping on with the hydraulic main tar-pitch factory, then the projector and "angle worm" pusher might be the best things. But even then they could not be used in the majority of the works in America, but only those of considerable magnitude. Coming to the cost, Mr. Shelton's figures for the kind of apparatus he advocated were $3100 per bench. Why not put in the inclined-retort system, and let Nature's force do the greater part of the work? He had recently designed and built very small gas-works for the city of Fredericksburg (Va.). There were only two benches of four retorts, while but one was needed, which was served by one man per shift up to 12,000 lbs. of coal per 24 hours. The cost of the charging apparatus worked out to $250 per bench, and it could easily supply four or even six benches instead of only two. The whole apparatus was exceedingly simple. An ordinary coal-waggon was used for charging the retorts. It was filled in the yard, and after being weighed was pushed on to a hydraulic elevator, raised to the charging-floor and the coal dumped into the retorts. The distribution took care of itself, and could not be improved upon by any method whatever. The upper retorts were charged with the same waggon; only in their case the elevator was allowed to come up about 2 feet higher. The waggon was rolled on to a small truck, which was then moved into position and the coal dumped as before. No skill was required; and, as he had said, the distribution was simply perfect, if care had been taken to break the large lumps in the coal. Slack would go in all right. The retorts were 10 feet long on the slope, and could carbonize at least 600 lbs. of coal per retort in four hours; though as there was no demand for all the gas that could be made, the charges were either reduced or allowed to run longer during this season of the year. The retort-house was only 28 feet wide inside and 22 feet high from the top of the ashpan of the recuperator furnaces to the wall plate on which rested the iron truss of the roof. The charging-floor was 10 feet wide, and ample; while in front of the bench (the discharging side) they had only 7 ft. 10 in., which was also ample by reason of a device of his own, consisting of swinging doors in front of each bench. These doors when opened formed a shed about 10 feet in length in front of each bench, and thus increased the size of the retort-house just when it was required. This device materially lessened the cost of the building, and answered every useful purpose.

Prints of the paper had been distributed in advance, and the following comments upon it had been received.

Mr. C. H. Graff (Indianapolis) wrote: There would seem to be no reason why the layout and machinery proposed by Mr. Shelton should not be successfully applied to a medium-sized retort-house. I do not know whether Mr. Shelton has in operation a plant laid out on the lines shown; but if he has not, I would certainly advise that he should place both the coke-pusher and the coal-projector on the same side of the retort-house. Actual working with the De Brouwer projector shows that when a through retort is being charged, the flame will shoot out of the other end to a distance of 10 to 12 feet, making it impossible for any work to be done in the vicinity of the retort that is being charged. With both machines on the same side of the retort-house, this objection is evercome. We have at Indianapolis a retort-house containing eight benches of nine through retorts 20 feet long; and both the charging and discharging machines are of the De Brouwer make. Our coal is handled entirely by the belt-conveyor system, which takes the coal directly from the railway cars into an overhead hopper in the retort-house or into the coal-store. The coke is removed by means of the De Brouwer conveyor. All the apparatus in connection with the handling of the coal and coke and the charging and discharging of the retorts is run by electric power; there being individual motors on each piece of machinery. Mr. Shelton makes the statement that "the coke-ram requires 2-horse power, the coal-projector 5-horse power, and the coal bucket, elevator, and crusher perhaps 5 to 10 horse power." As we have individual motors on each piece of machinery, it was very simple to obtain tests of the actual power required for the different pieces of apparatus. These tests show that our coal-conveyor, handling at the rate of 30 tons of coal per hour, requires 10-horse power; our coke-conveyor, running under an average condition, which would be with about 1½ tons in the conveyor, takes 6·1-horse power; the discharger or pusher, 6-horse power; and the charger or projector, 2·7-horse power. The charges in this case were 850 lbs. to a 20-feet retort. A test of the total load, made by taking half-hourly readings of the voltmeter and the ammeter on the generator, showed that the average load for the 24 hours was 14·9-horse power; while the maximum load was 31-horse power, and the minimum load 2·3-horse power. This, as stated above, is the total power required by all the machinery used in connection with the retort-house. In regard to the cost of the apparatus, our cost was considerably higher than that mentioned in the paper; but, from information I have received, I think the installations could be made for the figures mentioned by Mr. Shelton. I am afraid the author will find that the labour item will be more than he anticipates. We expected to run our retort-house with a full complement of 18 men; but we find that the best we can do at the present time is 25 men, which would be an average of twelve 10-feet retorts per man for 12 hours.

Mr. B. O. Tippy (Detroit) wrote: From my experience with drawing and charging machinery, I should say that many medium-sized retort-houses at present operated by hand labour

could profitably change to a machine charging and discharging basis. This would at the same time lessen the chances of labour trouble. Mr. Shelton confines his attention to installations of through retorts. Many plants are equipped with retorts having backs in them. Such installations are successfully operated by drawing and charging machinery. As one specific method of accomplishing this, I would suggest the following: A Bronder combination drawing and charging machine, in which the drawing-rakes, charging-scoops, and coal-bin are all on one bed-plate, and operated by one man. The machine is to be connected to a steam-pipe trolley which utilizes steam generated in the boiler-house. The coal is to be loaded into cars and elevated by a direct hydraulic or direct steam coke-elevator, with which most plants of this size are equipped, and dumped on heavy grates over the retort-house coal-bins—the lumps which would not fall through the grate to be broken by hammer. The coal could be weighed in the cars before being dumped into the bin, or the charging-machine, with its supply of coal, could be weighed on truck scales. Such an installation, in a plant (say) of eight benches of sixes in one row, would cost, including a coal-bin of 24 hours' capacity, and utilizing a coke-elevator already in, about $11,000 (£2200). If an elevator were necessary, it could also be used for handling the coke, and would cost about $2000 (£400). An entirely new concrete charging-floor, if required, would cost about $1600 (£320). The distance from the brickwork of the benches to the retort-house wall should be 21 feet, though a shorter distance could be made to answer. About two-thirds of the above cost is in the charging-machine and its accessories, the coal handling and crushing machinery, the overhead bin, and the extra strength of floor required. On the other hand, more than half of the saving in labour is made by the use of the drawing-machine. A drawing-machine only—such as the Foulis, for instance—can be installed for approximately $4000 (£800). They can be installed in plants too small to afford both; indeed, a plant can be very economically operated in this way.

Mr. Shelton not being present,

Mr. T. D. MILLER, at the request of the President (Mr. Paul Doty), offered a few remarks in reply; and a vote of thanks was accorded to Mr. Shelton.

THE USE OF TAR FOR ROADS.

In the "JOURNAL" a fortnight ago (p. 375), we recorded several references to the above subject. The following additional remarks by road surveyors and others will doubtless be read with interest.

It has just been reported by the Surveyor to the Egham Local Authority that the tar surface on the main road, which had been placed for a certain distance, was breaking up. This has led to inquiries being made of the County Surveyor as to his opinion on consolidating macadam by rolling only, as against using a grouting material while the rolling is in progress. The County Surveyor has replied that, although he has often tried to roll the granite dry, he has never succeeded in consolidating a single yard without some binding material. He believes that, if it is ever done at all, it is only after the roller has crushed the granite sufficiently to produce some fine material to fill up the interstices. He is absolutely certain that, if large experiments were made in trying to roll granite dry on such roads as those through Egham, which are used by thousands of motorists, the latter and the drivers of other vehicles using the road would soon be begging the Council to go back to the old method. The Council, in view of the great interest in the subject of authorities throughout the country, have decided that, on a portion of the main road which it is proposed to repair, granite only shall be used, properly rolled and watered; but the mud scraped off is to be carted away.

In the report of the Roads and Bridges Committee of the Sussex County Council, presented at a recent meeting, the County Surveyor stated that he had laid down an experimental length of tarred material on the main Brighton road, between Henfield and Woodmancote. It was laid on the old road surface, dry rolled, and treated with a composition of tar and pitch; a sprinkling of granite chippings being afterwards applied as a finishing coat. The road was much less noisy than ordinary macadam, and being waterproof, a thinner coat of material was necessary than with the old form of maintenance. It would also be seen that this method of construction compared very favourably in point of cost with the old system, and, in addition, reduced the dust nuisance to a minimum. If for no other reason, this would warrant a further and more extensive experiment. The length of road treated was 232 yards, with an average width of 21 feet, giving an area of 1624 yards super. The total cost was £93 5s., the cost per yard super nearly 1s. 2d., and the cost per mile £718 13s. 4d. To cover the same area with granite, applied in the ordinary way, and having an average thickness of from 3 to 4 inches, the cost would be £128 8s. 4d.; the cost per yard super, 1s. 7d.; and the cost per mile, £975 6s. 8d.—showing a saving in favour of the tarred material of 5d. per yard super.

The Kent County Surveyor, in his report on road maintenance, draws attention to the seriousness of road destruction by motor-cars. In some districts, he says, the roads have had to be repaired twice during the year, owing to the damage caused by cars. Especially was this so where flints were used for road-making; and his observations convinced him that the fast-travelling light cars did comparatively more damage than the heavier vehicles. The remedy he suggests is the use of more macadam on country roads, and, where possible, a tar surface. The latter, in his experience, had proved the best dust preventive.

A report presented by the County Surveyor at the last meeting of the Surrey County Council expresses the opinion that the best and most economical method of abating dust is to tar the surface of the roads, but that the surface of the tarred lengths is apt to lift in winter after rain and frost. Referring to this matter, the "Builder" says: "While this may be the case on roads that are simply tarred, the same effect is not found when the surface consists of properly laid tar macadam. We know several stretches of main roads in Surrey and other counties where tar macadam is doing excellent service, and remains in good condition after the heavy wear and tear of two or three years. The Kent County Council have been, and still are, most energetic in the improvement of their highways, and as a result the dust nuisance has been much mitigated in the county. We have recently made a careful inspection of the main road from London to Folkestone, a large proportion of which is treated with tar and faced with tar macadam, and where the laying of tar macadam is in active progress on intermediate sections. On the treated portions of the road there is generally a little dust. This is evidently due to the fact that in the middle of the track, where horses are usually driven, small stones are pounded out and ground to powder by the wheels of heavy road locomotives and the iron-tyred wheels of other vehicles. The latter also seem to be wearing slight ruts on either side of the central horse track. Unless horses can be provided with shoes of less destructive character, and vehicles generally with india-rubber in place of iron tyres, we fear it will be impossible to abolish dust altogether, although its production certainly can be very greatly reduced."

Experiments have been taking place at Beckenham with a view to diminishing the dust caused by motor-cars. In a report on the subject which Mr. John A. Angell, the Surveyor to the District Council, has just presented to that body, he says: "The tar painting on the main roads was commenced in May. . . . So far as can be seen, the results are to a great extent satisfactory. Too much, however, should not be expected; for though the formation of mud or dust by the working up of the binding material has been much diminished, to a large extent the abatement of the dust nuisance must, as heretofore, be largely a question of scavenging. In the case of the ordinary macadam or flint roads, scavenging, dry or wet, is practically incessant; the binding material, and consequently the roadway itself, being carted away in the form of mud or dust. Herein lies the advantage of tarmac and tar-painted roads over ordinary macadam, as the loose binding material either does not exist or its disintegration is prevented. . . . . Owing, however, to the smooth surface of the tar macadam or tar-painted roads, the comparatively little dust deposited on the surface is very readily diffused by the wind or passing carts, with the result that, unless such roads are daily scavenged, the nuisance arising from the diminished, but more readily distributed, dust constitutes an evil to be combated only by constant scavenging with occasional watering. The watering of tar macadam or tar-painted roads, however, is far more effective than on macadam; the absorption being lessened, and each application remaining effective for a longer period than on untarred roads." Having remarked that in muddy weather the difference between the two classes of roads is most marked—those being treated with tar resembling a skating rink, while the others are covered with mud—Mr. Angell described in detail the process of tar-painting.

The "Steam-Car and Electromobile Review" says that the suggestion of the Royal Commission on Motor-Cars that taxation derivable from these cars should be applied to better road construction will meet with general approval from motorists. "As the Commission points out, it is not possible to deal with the dust question by means of proscribing or setting forth any particular construction of car. The evil can only be dealt with by improved road-making. What form this may take, it remains for experts and experience to determine; but we personally are strongly of the view that tar should be an essential feature of any method that may be adopted. Tar odour is not unpleasant, and it is wonderfully healthy. The latter fact is not appreciated as fully as it might be. Dye-making from coal tar, for example, is the most health-giving trade that can be followed. The average life of tar-workers is 86; and the mortality among them is 80 per cent. lower than in any other factory trade. Tar and the smell of it are the best tonics and tissue-builders; and its use, besides giving good, clean, and durable surfaces to our roads, would also help to render our highways contributory in no small degree to an improvement in national health and longevity."

Use of Gas in Lime Burning.—According to the "Westminster Gazette," a shortage of wood in Litchfield County, Conn., has led to a new application of gas as an industrial aid. The lack of the usual fuel was threatening the restriction, and possibly the entire abandonment, of a once flourishing lime-burning business, when it was suggested that experiments should be made with gas as a substitute. As a result, the daily output of the kilns at Canaan and New Milford has been increased from 80 to 100 barrels a kiln. It is alleged that this is the first instance in any country of the use of gas in lime-burning.

BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

ANNUAL MEETING AT SCARBOROUGH—JULY 12 to 14, 1906.

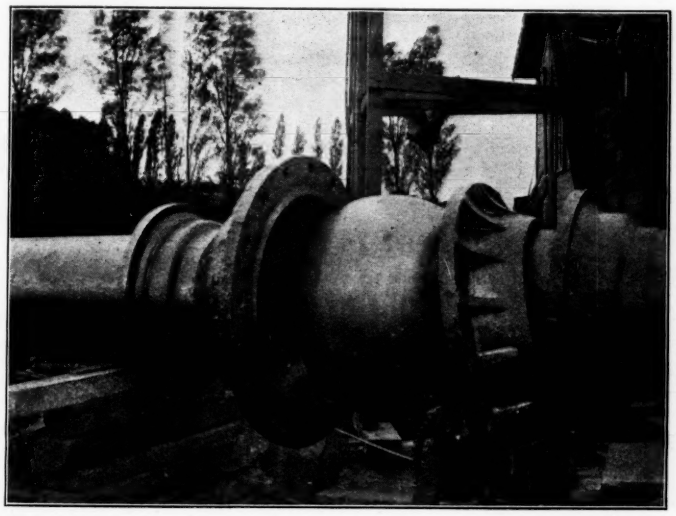
PAPER READ.

LAYING A SUBMERGED WATER-MAIN UNDER THE RIVER OUSE.

By W. H. HUMPHREYS,
Water Engineer, York.

As the narration of practical experience in water-works management is always welcomed by the Association, I offer no apologies for acceding to our President's desire that a short account of the laying of a submerged pipe under the River Ouse should be given to this meeting.

As preliminary to the particulars as to this main, it may be said that the population supplied by the York Water-Works is nearly 100,000, one-third, approximately, being situated on the same side of the river as the pumping station. Prior to the laying of the submerged pipe, the remaining two-thirds were supplied through two 15-inch mains laid across the principal bridge situated in nearly the central part of the city. There was not room on the bridge for any more mains; and had this not been the case the distance from the pumping station to the bridge would have involved a long additional length of main. For this, and other reasons which need not be described, it was decided to cross the river at a point several hundred yards nearer the pumping station. There was no other bridge in existence in this neighbourhood; so the only alternatives were to build a new bridge by which to carry the pipe line or lay the main under the river. The river for some distance below our pumping station is about 14 feet deep at summer level; but at a point named "Clifton Scope," where the river broadens, it is only 9 feet deep at the deepest point, but covers a width of 197 feet at summer level. Before the river was held up by the Naburn locks, there used to be a ford at this point, and historians state that it was much used by the Roman legions whose principal camp was a short distance away. However that may be, it was the only available point for submerging a pipe.



Ball-Joint for the Submerged Main.

After permission had been obtained from the River authority, and wayleaves settled, it was decided to do the actual laying in June, when the river would be lowered for seven days to give an opportunity for structural repairs to the river banks, buildings, &c. A section of the river at the point named had been taken, and bore out the facts already stated. The first step was to dig a trench to take the pipe; and this work had, of course, to be done before the river was lowered. One of the difficulties to be faced was the frequent and heavy floods. The watershed—the largest in England—is supplied principally from the beautiful dale-districts of Yorkshire, and the normal flow of the river at the point in question is about 140 millions daily. During almost the whole of the time the work was in progress, we were much troubled with flood water. In getting out the trench, the services of some sand bargemen were requisitioned. These men are used to obtaining sand and gravel from the bed of the river, and know all its peculiarities. They succeeded in only obtaining a trench a little over a foot in depth, as the boulder clay withstood the power of their derricks and scoops. Recourse was then had to a small continuous bucket dredger, the property of the River authority. After several days of very hard work, this removed sufficient of the clay and boulders to enable us to lay the pipe.

It would have been desirable to have secured a greater depth, but the toughness of the clay and the many boulders, with the difficulty of keeping the dredger on the track of the trench owing to the flood, prevented that being done prior to the time of commencing to lower the river. The dredger had been turned in order to dredge well into both banks, and thereby enable our workmen, after the river was lowered, to dig out from each bank to join on to the trench made by the dredger and the sand bargemen. Continuous soundings were made during the progress of the dredging; and it was noted how rapidly the trench filled with gravel and other material washed into it—more readily no doubt by the flood water in the river. It was feared this would occasion some trouble later, as it did, when the pipe came to be laid.

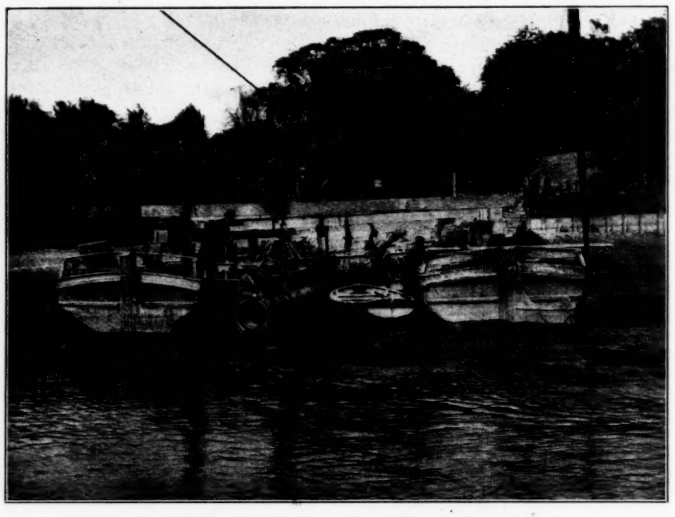
The class of pipe to be laid had been very carefully considered, and it was ultimately decided to order some 15-inch socket and spigot pipes, each 12 feet long, and 1 inch thick, with a wrought-iron hoop shrunk on to the sockets. The average weight of each of these pipes was 18½ cwt. They were all double coated with Angus Smith solution. Five ball-and-socket joints were required. Each measured 3 ft. 5 in. over all, and were machine-ground and made perfectly tight at any angle, under a test of 300 lbs. When these castings were delivered on to the ground, they were further coated with three coats of bituminous solution as a precautionary measure. Observation had been made as to the oxidizing effect of the Ouse water; and as many samples of uncoated iron had been taken out of the river, after many years immersion, in excellent condition, this was considered to be unimportant.

The contract for the laying of the pipes arranged that the pipes should be slung into the river and lowered into position from a heavy cable stretched from side to side. The breaking strength of the cable was 75 tons. Three piles were driven into each bank, two for anchoring, and one for guiding the cable. Chain blocks were slung on the cable for hoisting and lowering the pipes. The pipes were put on to the cable at the higher bank, and were pulled to and fro along the cable by a steam derrick. A large jib-crane was also fixed at the higher side of the river, to give any necessary lift required as the pipes were being slung.

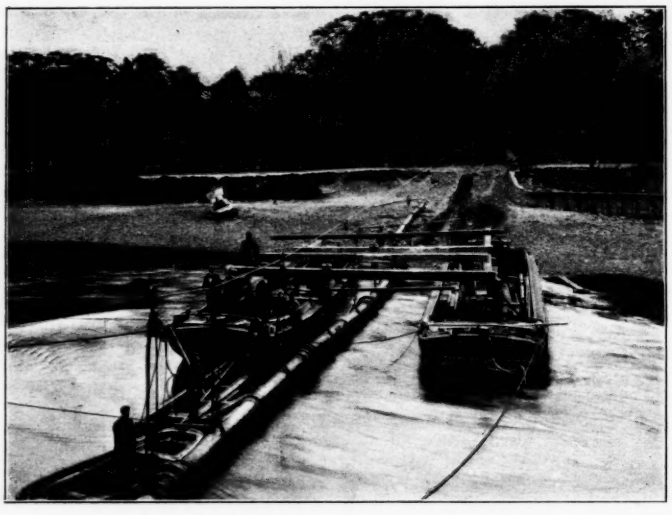
At the time of laying the pipes there was a depth of 4 ft. 6 in. of water and a width of about 100 ft. The water was flowing very fast, probably 200,000,000 gallons daily, which made it difficult to keep the two barges—which were moored broadside to the stream—in position. The barges were held at a distance of about 8 feet from each other by strong cross timbers, which were intended to take the weight of some of the pipes after they were lowered a sufficient depth from the cable. The jointing and slinging of the pipes was next proceeded with. Two pipes were jointed together on small trucks which could run under the end of the cable. At the ends of these two pipes two halves of the ball-joints were connected. They were then hoisted on to the cable by the chain blocks, and guided across the stream by the derrick—valuable assistance being given by the crane. These two pipes were taken to the far side of the river, and lowered between the barges, which then took the weight of the pipes. When this was done, two other pipes were slung over and lowered in the same manner, and then jointed at the ball-joint—thereby covering nearly one-half of the width of water. The weight

of these four pipes was, except at the ends, taken by the barges. Two more pipes were then slung into the river in the same manner and jointed, at the ball-joint, with the first four. These latter pipes were held in position by the cable. Two more pipes were likewise slung and jointed to those already in position; the only difference being that the crane took the weight at the bank side. There were thus in position, held by the crane cable and by the barges, eight pipes, with three ball-joints completed. After going very carefully over the joints, all that was necessary was to get the trench as clear as possible, and lower the whole at each chain block, in unison.

The trench was found to be by far the greatest source of trouble, owing to its filling up; but the risk had to be taken of lowering the pipes and clearing the trench afterwards; the work up to this point having taken six days of the seven allowed. Each end of the pipe-line had to be held above the water level to allow the remaining pipes to be joined; and this was done by the cable at the shallow side, and the crane at the other. When all was in readiness, a reliable man was placed at each block, and by signal the pipes were lowered inch by inch until they were firmly bedded beneath the water. As only a few hours remained for jointing up the remaining four pipes (two at each end) the work had to be somewhat hurried. The two pipes at the deep side were successfully connected and lowered into position, leaving one end in the trench just above the water-level. At the other side we were not so fortunate; as, when we were lowering the last two pipes into position, the anchor chain at the Clifton side snapped, and the pipes fell a distance of about 8 feet into the trench. Fortunately, they missed the end of the pipe-line they had to be joined to, or the accident might have been much more serious. As it was, it was peculiarly unfortunate, as we had very few hours left to complete the work. When the cable parted, it whipped over with great force, and dropped exactly between the two barges on which we were at work. How it missed us, none could understand. One poor fellow, who was astride the pipes regulating one of the chain blocks, went down with the pipes; but in the act of falling a steel hawser caught him under the chin and pulled him away from the pipes—otherwise he would in all probability have slipped under them. No time was lost in getting the cable together, and in a few hours we had the satisfaction of seeing the pipes safely jointed, and lowered into position, with about six hours to spare.



Lowering the First Pipes into Position.



The Pipes Ready to Lower in a Strong Flood.

As soon as the river rose to its usual level, very careful soundings were taken, and it was found that two of the ball-joints would have to be lowered about 9 inches to enable the pipes to effectually clear the bed of the river. A diver was secured; but as he made very unsatisfactory progress, the Contractors' Manager, Mr. Slater, decided to go down himself. The author must be excused one moment here while he pays a tribute to the courage and skill displayed throughout the carrying out of this work by Mr. Slater. He went under water day after day to clear out the loose stuff from under the pipes and allow them to settle into position; and in addition he trained two of his foremen and the craneman as divers. With two divers' outfits hired from Messrs. Siebe Gorman and Co., we could thus keep two men at work each day. They stayed down from twenty minutes to an hour each time, and the progress was extremely slow; but patience and perseverance were at last rewarded by finding the pipes clear of the river bed. The only amusement we got out of the work was on one occasion when Mr. Slater suddenly floated to the surface wrong end up. In stooping, the air had got into his diving dress, with the result that he shot to the surface. He was speedily rescued, and said he had enjoyed the experience immensely. To protect the pipes, a few bags of cement and gravel were lowered into each side of the pipe, as the dredger had necessarily made a very wide trench. The trench is now entirely filled up; and, as the pipes are upon a good solid bottom, and well protected, it is expected they will serve their purpose for a great many years to come.

A valve, with bye-pass meter, has been fixed on each bank, to test the main from both sides of the river. The test is made periodically, and always proves the main to be perfectly tight. This work has been of the utmost value, as by securing an alternate route to the most populous side of the river, we have been enabled to materially improve the supply thereto.

Discussion.

The PRESIDENT tendered his thanks to Mr. Humphreys for giving this paper so readily, and with little notice. He also thought the thanks of the members were due to him for having described a rather difficult scheme, which had to be carried out under restricted conditions, and was successfully completed. He (the President) had no doubt members would have varied ideas as to how they would individually have carried out the work, especially those who had executed similar work. Perhaps the author would tell them why a tunnel was not carried under the river, so that thorough inspection could afterwards be made. He (the President) had rather a long line of pipe under the North-Eastern Railway. There inspection had been found necessary; but this might be partly due to vibration, which would not have to be dealt with under the River Ouse. It, however, seemed to him that, going through clay and so forth, it was possible a tunnel might have been carried through somewhat readily and at moderate cost. The members would be interested in knowing the cost, or at any rate the approximate cost, of the work. Then they would be able to compare it with a tunnel scheme. He was pleased to see the excellent photographs illustrating the paper; and he was hoping that photos.

would generally be used for illustrating papers under the new arrangement for printing the "Transactions."

Mr. Easton Devonshire (London) remarked that, as the President had suggested that any experience the members had had elsewhere would contribute to the usefulness of the discussion, perhaps he might be allowed to give a little information about a piece of work he carried out at Antwerp about 20 years ago. He would have to tax his memory a bit, but he thought he could remember the details sufficiently to explain what was done in that case. They had, in going out of the town, to cross a moat. The width was about 200 to 250 feet; and they wished to cross this with an 8-inch pipe. The members would perceive a great difference in the conditions between this case and that of Mr. Humphreys. They had still water to deal with; so that he was not claiming that his plan had to be carried out under anything like the circumstances that Mr. Humphreys had to meet. At Antwerp, they used an 8-inch cast-iron hydraulic pipe. This was built up on a staging constructed on the bank of the moat, with both ends turned up to the angle of the slope of the banks. The water in the moat was lowered so far as he remembered a couple of feet, while the building up of the pipes proceeded. He then placed some 12 inch by 12 inch timber baulks, along the whole length of the pipe, fastening them with hooked straps which could easily be removed. Half of a strap went down each side of the baulk of timber, forming a hook under the pipe, the two halves meeting over the top of the baulk where they were attached to each other by a light bolt. Then he got a number of petroleum barrels, which he fastened in pairs on either side of the pipe—calculating their displacement so as to float the pipe. He then connected the barrels together by a piece of lead pipe, fitted with taps, and communicating with a water-main on shore. On raising the level of the water again, the whole line of pipes 200 feet long (with the ends held up in the requisite sloping position) was floated off the staging and towed over the trench which had been excavated just beforehand. This plan for minimizing the silting of the trench would certainly have been an advantage in the case of Mr. Humphreys' work, could it have been adopted. The pipe being set up independently of the trench, and being put down in one piece, the trench could be made at the last minute. The pipe being floated over the site, guides were drawn in to keep it in a vertical position. The water was then turned on slowly into the barrels; and then the whole length sunk slowly to its position in the trench. He supposed that it took about two hours from the time of the filling of the barrels to the burying of the pipe in the trench. The water was about 8 feet deep. A man went down, released the barrels, and pulled away the hook-straps; and up floated the baulks of timber. Then they dredged the sand over the pipes, which had not given any trouble since. They were able to use a very heavy pipe for the purpose, and a strong joint; and the conditions were simple, easy, and effective.

Mr. R. E. Middleton (London) said they ought to be grateful to Mr. Humphreys for a valuable, practical paper. In it there was a point he (Mr. Middleton) could not understand. Mr. Humphreys said: "The watershed—the largest in England—is supplied principally from the beautiful dale districts of Yorkshire; and the normal flow of the river at the point in question is about 141 millions daily." He (Mr. Middleton) did not know what the drainage area of the Ouse was; but taking the Thames, the normal flow was just a little more than ten times this quantity (1435 million gallons a day), and the minimum flow was more than 200 million gallons. So that he thought Mr. Humphreys was labouring under a mistake when he said this was the largest drainage area in England. With regard to the laying of the pipe, he would suggest that the same thing might have been done more easily by the use of steel pipes, and laying the whole in one piece. Mr. Hunter and himself, as Engineers of the Staines scheme, had to lay six syphons, each to carry 75 million gallons daily under the Rivers Colnbrook, Wraysbury, and Colne. The greatest length of any of these syphons was about 103 feet. The dimensions of them were 5 ft. 9 in. vertically, by 7 ft. 6½ in. horizontally. These were built up over the rivers, as there was no traffic on them. An excavation was made, partly by divers and partly by grab, 5 feet below the bed of the river; and the syphons were laid in position by means of chains, sling-hooks, and screw-couplings. They were gradually lowered in position; but in no case was it possible to put them down at first-go. There were lumps in the bottom; and they had to be lifted again a little, and a diver sent down to clear away the lumps. However, the syphons were completed, each in one piece, in a short time; and the cost was small. When set, they were covered in with concrete. A somewhat similar arrangement was designed for crossing the Medway; the distance being about 120 feet, where a steel pipe was designed to cross the river; the ends being turned up, so as to be at about high-water level, at the place where the crossing was being made—the rise and fall of the tide there being about 9 feet. He did not think the work was actually finished; but it was now in course of execution. He had also designed a similar work for the Wiltshire Avon, which had not yet been carried out. In the case of the syphons at the Staines reservoirs, the joints, with the concrete aqueduct to carry 150 million gallons a day, were made after the syphon had been sunk to the bottom of the river. With smaller pipes, it was quite easy to make the joints at water-level when the pipe had been sunk.

Mr. C. F. Gettings (Teignmouth) said that he felt particularly interested in Mr. Humphreys' paper, as he would be having a similar case to deal with shortly. In this instance, he had a tidal river, which was ¼ mile wide. At low water, the channel was 120 feet wide; and they had 2 feet of water, with a rise at ordinary tide of 10 feet. He should like to know why Mr. Humphreys fixed upon cast iron for his pipes, and not steel. What he was proposing to do in his own case was to use Mannesmann tubes. He was putting in a duplicate 9-inch main, and was using flanged tubes. He had an exceedingly high pressure to deal with, a working head of 940 feet, and was restricted by the Harbour Commissioners to a minimum cover of 3 feet below the bed of the river. He proposed encasing the mains with 12 inches of concrete, so that their total depth below the existing bed level would be about 6 feet. They had an exceedingly strong current to deal with, which would probably give some trouble. He should like to know from Mr. Humphreys whether the river in his case was subjected to any scour. He saw that Mr. Humphreys had practically laid his pipe level with the bed of the river; and from what he (Mr. Gettings) gathered, he had only put in sufficient concrete to fill in the cavities dredged out at the side of the pipe. He should like to know whether there was any heavy traffic there. In his own case, they had a heavy barge traffic, some being hauled by steam tugs, while others were poled up and down the river. It seemed to him that the bedding of the pipe in Mr. Humphreys' case was rather a doubtful matter. In his own case, they would have very great difficulty in getting the pipe down under such circumstances, as if they dredged a few hours before they wanted to get the pipes bedded, in all probability the trench would be partly silted up again. The question of cost was an important item, as unless this was given it was quite impossible to make any comparison. He should also like to know whether any other gentleman had had experience of Mannesmann tubes. He knew he was taking rather a venturous course, as he was proposing to put in about 15 miles of Mannesmann tubes for a main supply consisting of 9, 6, and 4 inch tubes. He had had some difficulty in persuading the Local Government Board, as he believed it was the first complete scheme they had ever passed. However, Mr. Wilcock had given his approval, after going into the matter very closely. He might emphasize the point that there would not be any service mains, but direct supply mains to service reservoirs; and they were not proposing to tap the mains at all. Perhaps it would be interesting to the members if he informed them that, in adopting the Mannesmann tube instead of cast iron, he was saving, on the initial outlay, an amount of no less than £4700. The scheme would now cost somewhere about £19,300.

Mr. H. Hall (Montrose) remarked that about ten years ago, he had to lay a similar main under very different conditions. He had to lay his in a strong tidal current 500 feet across; and the depth was about 20 feet. But the nature of the current was such that 6-inch pipes were simply out of the question. He had to lay it after the manner of a cable; and what they had hoped was that the pipe when laid would have undersunk itself into the bed of the river. The method he adopted was to use ball-socket joints; a number of the pipes being laid out and paid out similar to a cable. They had no less than thirty of these joints. Experiments proved that the work was quite a success. It was completed in about a week's time at a cost altogether of something like £270.

Mr. Gettings observed that the average length of Mannesmann tubes was about 30 feet, and they were about one-third the weight of cast iron. These were advantages in an

undulating country. There was a considerable saving in joints; and a very high test could be obtained.

Mr. R. H. Wyrill (Swansea) said he had laid mains where there had been a considerable amount of scour; the boulders coming right down the Swansea valley. The floods were very violent; and the shape of the river bed was altered from minute to minute almost. In one case, he laid an 18-inch cast-iron pipe across, after previously dredging the channel. He did the work in two portions, commencing at the east end first. This was necessary, because the water was up and down so quickly, and they had to provide for floods. After putting in this 18-inch pipe, he surrounded it with concrete, leaving it somewhere about a foot below the normal bed of the river. This was perfectly successful. He next year had to examine the bed of the river; and he found the concrete had been absolutely polished. Fortunately he had put in some test-marks, to see the rate of erosion of the concrete; and he found it had actually been worn down practically an inch—some cases more, some cases less—simply by the rattling down of the boulders, and the high velocity. This had reference to the question raised by the previous speaker as to the erosion and the chance of scour when the pipes were laid. He had laid pipes across a soft-bedded river where they had mud, and in these cases 6 and 8 inch diameter pipes were used. He did this simply by dredging, and putting down a Mannesmann steel tube. He knew the tubes Mr. Gettings referred to, and had seen some extraordinary experiments with them quite recently, including the testing of some of them up to 4250 lbs. per square inch. With reference to the question of cost, in this particular case at York, they had not the figures before them. He took it, however, that it would probably have cost nearly £1500 to have constructed a subway, by means of which one could then have inspected the pipe properly. He himself had found that, generally speaking, a subway was a great advantage, though, of course, it cost more. The pipes never went wrong, because they could see from time to time what was taking place in the subway. The difficulty was to get the subway large enough in the first instance; and it was a good thing to look well forward, because, if they had a 12-inch pipe going across a river in a subway, it might be necessary later on to lay a pipe 2 ft. 6 in. In the case of the 18-inch pipe to which he had referred, he thought it would be necessary to put a 24 or 30 inch pipe across that very river. Although the concrete protection appeared to have been sufficient, he was seriously considering the question of a subway under the river, making provision for not only a 24 or 30 inch pipe, but also for the 18-inch pipe, in case the scour continued. The 18-inch pipe was surrounded by 12 or 18 inches of concrete; and they had lost 1½ inches of it. He thought it was only a question of time when the boulders would wear away the concrete; and it would then be necessary to reconstruct the whole syphon. The width of the river at that point was about 150 feet.

Mr. J. S. Pickering (Cheltenham) said he should like to know why Mr. Humphreys laid the main in cast iron in preference to steel. It appeared to him it would have been preferable to have had one length of steel main rather than of cast iron. The steel main would have been something like half the weight; and there would not have been so much leakage at the joints. Mr. Humphreys had been extremely fortunate in getting his joints tight—particularly the ordinary spigot and socket. There was considerable risk with the lead joints; and, if leakage occurred, it would have been difficult to have caulked the pipes under water. He also advocated the laying of pipes in duplicate across a river when all the tackle was at hand; and he described a piece of work that he had recently had to carry out.

Mr. Humphreys, in reply, said Mr. Middleton took exception to a statement he had made; and he might deal with it at once. He had always understood that the Ouse had the largest watershed, the drainage area of which, above the City of York, was 800,000 acres. If Mr. Middleton could give him the drainage area of the Thames——

Mr. Middleton: 3766 miles.

Mr. Humphreys (proceeding) said he did not think the members were altogether fair to him in pressing for the cost of this work. He had given them the benefit of his experience in carrying it out; but he did not know that it was necessary to go into the cost. The paper was hastily written; but if at any time there was any point about it which members would like more detail, he should be happy to give it. He could, however, assure them that the question of making a tunnel and laying a pipe in steel or cast iron was most carefully considered; and when he told them that the cost of a tunnel was nearly £2000, they would see why he hesitated. As to steel pipes, they obtained tenders from several makers; but for various reasons, which he could not enter into then, they concluded that, as the pipe was to be laid in the bed of the river, and was likely to last for 100 years or more, and it was very doubtful as to how long a steel pipe would last, a cast-iron pipe was the best for their purposes. This was the main factor—the life of the cast-iron pipes would be greater in the circumstances in which they were placed than that of steel ones. The cast-iron pipe, too, was cheaper than one of steel; and when he mentioned that the cost of laying the pipe was only about £300, the members would understand why a tunnel was not built. The work was well done; it had been tested, and the pipe had been in position now for four years, and had not given the slightest trouble. There was a question asked as to the concrete laid to protect the pipe. This was done owing to the great width of the trench made by the dredger. The traffic on the river consisted principally of barges going up and down with coal and other goods, and passenger steamers. Another risk that might have occurred was in the dropping of an anchor, and the drifting of an anchor in time of flood; and so the bags of cement and gravel were deposited on each side of the pipe, to prevent damage in this respect. After the pipes were finished, the flanges were 6 inches below the bed of the river; and, as there was a great deal of scour, they found that, on the last soundings being taken, the bed of the river absolutely full up as if it had not been disturbed. It was the scour that troubled them in laying the track. Mr. Pickering raised the question as to the joints. There could be no question as to drawn joints. They were under compression; and they could not possibly be drawn. This was one security they had. A duplicate main was not necessary in this case, because they had two mains crossing the river—making three in all; and if it were necessary to lay a second pipe in the position in which they laid this one, it could be done quite easily. His impression was that it was a remarkably cheap piece of work, and extremely well done. He felt that a description of the work might perchance give anyone who had to undertake similar work a hint or two that would materially lessen the cost, or be useful in other respects.

A STEEL AND CONCRETE WATER RESERVOIR.

The water supply of the small town of Cranleigh, in Surrey, has been augmented by the construction of a new service reservoir of 500,000 gallons capacity, which has just been erected at Bookhurst Hill. The structure is made of concrete, reinforced with steel joists of light section and sheets of expanded steel. The floor of the reservoir is 4 feet below, and the full water-level 6 feet above, the natural ground level, which is 292 feet above Ordnance datum, and about 100 feet above the town of Cranleigh, which is 1½ miles distant. The method of construction is described and illustrated in a recent number of "Engineer," from which the following particulars are taken.

In the general design, attention was paid to the fact that in the application of any metal reinforcement in concrete it is of the utmost importance that all joints in the framing should be efficiently secured, and should not merely depend on the concrete. The illustration of the general arrangement of the steelwork shows that the floor joists are placed on a specially prepared bed of rubble, in which a series of land drains have been laid. The ends of the joists are connected by fish-plates. The roof joists are laid parallel to the floor joists, and are carried by light steel columns forming the reinforcement of the finished concrete columns, which are 10 inches square. The expanded metal of the walls is shown in position. The walls are reinforced with expanded steel both on the inside and outside; the sheets being placed 6 inches apart. The thickness of the main walls is only 9 inches. The rough concreting of floor, walls, and columns is shown completed, with the roof-centring in position; the concrete casing for the roof girders being formed at the same time as the roof. The roof is 6 inches thick, armoured with one layer of expanded steel on the underside. The outside of the roof and the whole of the interior of the reservoir, with the columns, have been rendered with 1 inch of equal parts of cement and sand, which is found to be absolutely water-tight for reservoirs of moderate depth. The chief dimensions of the reservoir are: Length, 102 ft.; width, 83 ft. 6 in.; depth, 11 ft. 4 in. over all. The tank is divided by a wall of the same section as the outer wall.

The cost of the structure, with all connections and fittings, worked out at £4 2s. per 1000 gallons of its contents—a price which is stated to be considerably lower than that of either brick or plain concrete reservoirs built in the immediate neighbourhood, though in this case the reservoir is made in two compartments with a dividing wall, which was not the case in the other reservoirs referred to.

THE FRINGE OF PHOTOMETRY.

By H. Leicester Greville, F.I.C., F.C.S., &c.

The "Fringe of Photometry" may seem a somewhat curious title to "point a moral or adorn a tale." Nevertheless, it may be possible on consideration to see that the estimation of the real available illuminating power of gas is but feebly defined by even the most scientific methods of official testing. There can be no finality as long as, ignoring modern developments, the photometrical value of gas is to be defined by methods of developing light on the basis of the limited combustion of so-called luminous hydrocarbons. Ever since the introduction of the development of light by incandescence, the older system, founded on luminous hydrocarbons, should have taken, using colloquial language, "a back seat." Why this has not been duly recognized is no doubt the fault of the natural conservative instincts which prevail in this country, and which, however useful in the way of politics, must always be regarded as disastrous to the progress of science.

If we refer to the history of the introduction of gas as an illuminant, we find that the discovery that by the treatment of coal in a certain way it was possible to convey a means of furnishing light through pipes at a long distance was a distinct revelation. The only competitor was the candle of the commonest description; even paraffin lamps were in those days an unknown quantity. A source of light which could be brought from a distance free of carriage, was so distinctly new that it is little to be wondered at that at this early period a simple jet of flame which replaced the light of the average candle should not have been welcomed. The question of the possibilities of cooking by the use of coal gas were in those days probably never thought of. From the initial stage of the introduction of gas up to the present time there has been a development unprecedented in any known industry; but the trend of the progress of gas manufacture has made it more and more exigent that certain conditions should be laid down between the producer and the consumer. For the purpose of the present article, it is simply proposed to consider the matter of illuminating power.

We have had two most valuable papers recently read on the question of the development of light from gas—viz., those by Mr. Charles Carpenter* and Mr. W. R. Herring.† The Carpenter burner solved the vexed problem of dealing with all qualities of gas with the use of only one burner. This was necessary from the maintenance of the old regulation of fixing the gas consumption to a 5-feet rate. Possibly, however, this was better than the alternative of prescribing different burners for varying qualities of gas. The absurdity of the whole thing is this—viz., the prescription of the burner to be used for testing by Act of Parliament, that it should be available for use by the consumer. I do not sympathize with Mr. Carr in his remarks on Mr. Carpenter's paper; but there is no doubt that no scientifically constructed test burner of a high grade would or could ever be used by the general public, if they had any brains.

On this point of the question, Mr. Herring's paper affords most valuable evidence. His communication is of a scientific character, and is published in a scientific journal. Unfortunately, the information does not therefore reach the ear of the general public who represent the average gas consumer. It is to be regretted that the man of science cannot as a rule write so clearly as to place scientific progress within the knowledge of the commonalty, and that the average journalist, conspicuous in literary acquirements, is so misleading in his facts when he intrudes on the borderland of science.

Reverting to the question of gas, What is the value of this at the present day to the consumer? A pure question of price in proportion to value received. What does this depend upon? Two questions—the maximum light he can obtain, apart from any test burner, and the heat he can obtain for cooking purposes. How are these measured now for the protection of the consumer? The value of his gas for cooking depends on its capacity for developing heat. On this point there is no parliamentary definition. On the question of light, when an average consumer can buy a burner of the incandescent type for about 8d. to 1s., why should he go to the expense of a scientifically constructed test burner at a much higher price, and with the disadvantage of the constant breakages of chimneys? What the efficiency of the Carpenter burner is, I have no knowledge. We can, however, take Mr. Herring's paper as to the value of the incandescent burner. I refer to Table "C." The incandescent burner gives a value of about 31 candles per cubic foot of gas. The equivalent value of the most modern test burner would not probably exceed 4 candles at the very outside. Further comment is superfluous. Another point is shown by Mr. Herring, and one which I recognize as most valuable—that in spite of considerable variations in the candle power of gas as determined by the No. 1 argand, the light afforded by a good incandescent mantle per cubic foot, with a proper regulation of gas and air supply, is practically constant. Tested in this way, the light development does not seem to be altogether a function even of heat.

The average gas consumer should as soon as possible be made to understand that it is within his power to get a 31-candle light from a single foot of gas. He or she wants to be shown that in gas there is available a source of both heat and light which can be obtained at a cheaper rate than even any municipal supply of electricity. A house may be wired for the supply of electricity; but there is no official guarantee that the charge for current shall afford any equivalent to the consumer even in the matter of light. On the simple domestic detail of boiling a kettle of water or cooking a rasher of bacon, electricity is hopelessly at a discount as compared with gas. Official bodies who are ever eager to place the most stringent conditions on gas companies, withdraw the local policeman where electricity rules supreme, and extract money with a bland smile from the pocket of the unfortunate ratepayer to make up for deficiencies in unsuccessful electrical undertakings.

Enough as to this. As the consumer can now obtain (say) upwards of 150 candles from the combustion of his 5 feet of gas, which is officially recorded as some 13 to 16 candles, the pertinent question arises as to what is the true illuminating power of any particular gas. Are we not, in adhering to the older methods of testing, simply hovering round the fringe of the matter? Again, even with Mr. Herring's lengthy experiments, finality has not been reached. It is recognized, rightly, that, even with the incandescent mantle, there are questions which have not as yet been thoroughly threshed out. The best development of light is presumably the relation of the mantle to the gas, taking into consideration a properly adjusted air supply; but we have as yet to know the relations of luminous and calorific values, flame temperatures, and flame volumes, which conduce to the highest possible results. We know that the use of a mantle enables us to obtain a brilliant light from an otherwise non-luminous gas. We know, too, that the calorific intensity of the flame is one of its most important functions; also that the shape and volume of the flame should be so adapted to the mantle as to bring all portions of the latter to maximum incandescence. But there are as yet many details to be ascertained.

With the full recognition of the possibilities of gas lighting by incandescence, we shall slowly but surely drift into the supply of gas of lower (official) illuminating power, with mutual advantage to both consumer and producer. I read in the last number of the "Journal" Mr. R. Bruce Anderson's able presidential address before the Irish Association of Gas Managers, in which he states that he is making some experiments in the direction of the supply of low-grade gas. I quite endorse his general views on the subject. He puts the matter tersely when he says: "The guiding bargains struck between consumers and companies were made long before the days of incandescent lighting, and subsequent ones have merely followed, on stereotyped lines, as fresh Acts or Orders have been passed." I shall be glad to hear of the result of his experiments on what he facetiously terms "stretched gas." The subject is of great interest. As a final allusion to the papers of Mr. Herring and Mr. Carpenter, I am glad to find a graceful recognition in both cases of the services rendered them by their respective scientific experts. This is the more noticeable as such compliments are sometimes unfortunately omitted.

* See "Journal," Vol. XCIV., p. 886. † See *ante*, p. 316.

THE PUBLIC LIGHTING DEBT AT MESSINA.

Dispute between the Continental Union Gas Company and the Messina Municipality.

[Communicated.]

Though the Continental Union Gas Company, Limited, have a very large share in the interests of the Union des Gaz Company, yet the only gas undertakings that directly belong to them are the comparatively small ones of Messina, in Sicily, and Montargis, in France. The latter works are even very much smaller than the former; the annual coal consumption being, we believe, about 3000 tons at Montargis, and about 12,000 tons at Messina. The English Company have had frequent difficulties with the town authorities of Messina; and at the last general meeting of the Continental Union Gas Company, Limited, a report of which appeared in the "Journal" for Dec. 19, 1905 (p. 841), the Chairman, Mr. Arthur Lucas, referred to the large sum that was then due from the Municipality to the Company for the public lighting of the town. On the 30th of June, 1904, this debt amounted to no less than £26,160, and in December, 1905, it still stood at £24,784. The Municipality had not carried out their engagements to pay off the debt, and interest at 4 per cent. was accruing on the instalments as they fell due. The Chairman said that "the Municipality fully acknowledged their indebtedness; and there was agreement as to the amount. But when they had to deal with a Corporation who had nothing in their coffers, it was very difficult to settle matters." This we can quite believe; for blood cannot be got out of a stone, and money cannot be obtained where there is none.

Judging, however, from an article in the current number of our Italian technical contemporary "Il Gaz," the Municipality of Messina are now ingeniously endeavouring to get out of their liabilities; and, indeed, in a way to make the Continental Union Gas Company themselves pay for arrears in the public lighting gas bill. At least, putting two and two together, that is how the matter strikes us. The English Company's concession for the lighting of Messina goes back to the year 1862. This was renewed in 1887; and the price of gas was fixed at 20 c. per cubic metre

(equal to 4s. 6d. per 1000 cubic feet) for the public lighting, and at 25 c. per cubic metre (or 5s. 7½d. per 1000 cubic feet) for private lighting. The concession contained a clause to the effect that, if scientific progress brought about economy in the cost of manufacturing gas, and when the Gas Company, either on its own initiative or at the request of the City, had introduced these more economical methods, systems, or processes, then the savings resulting from them should go in part to the benefit of the consumers and the Municipality. It is said that the Company some time ago introduced economies in their working; but, on being requested to reduce the price of gas, they declared that nothing, or almost nothing, had been saved in manufacturing costs. The town authorities, not being satisfied with this answer, have instituted legal proceedings so as to obtain the payment of their part of the alleged profit, according to contract, commencing from the date when these economies were first obtained.

Signor Sospizio is the technical expert for the Municipality, the legal representatives of whom are Professor Buscemi and Signor L'On. Orioles. The latter will appear to argue the case when it is before the Arbitration Court at Rome. Sig. Cav. Cardin Fontana, the Royal Commissary, is closely following this question in the interests of the public, and also of the gas consumers, who hope to see the price of gas reduced. The question in dispute is certainly a rather nice one, and, we should think, of some degree of novelty. Especially is it so under the peculiar circumstances of the case, and bearing in mind the heavy debt due from the Municipality of Messina to the Continental Union Gas Company.

COMETS IN THE GAS INDUSTRY.

By "An Observer."

No. 5.—What is an Equitable Selling Basis for Gas?

A heathen potentate of old time asked scoffingly: "What is truth?" and when we read the discussions of late years, bearing on the terms on which gas should be sold, we are tempted to say in a similar vein, "What is an equitable price?' Until within the last few years, there was only one answer to that question. One or two small country places, selling gas at 5s. or 6s. per 1000 cubic feet, had found that if they expected to do any stove or engine business worth the name, they must offer a special discount on gas consumed for these purposes. But this was the exception rather than the rule; and generally speaking, gas companies—and for that matter many other tradesmen—prided themselves on having one price to all. What are now called "differential rates," were then "two prices," and were looked upon as something beyond the ken of honourable and respectable business.

The differential rate is a modern development; and, following the usual precedent, it is referred to as a matter of equity. But on this point it is well to be perfectly candid, and to avoid cant. Is there a desire in the commercial world for a nearer approach to abstract justice and equity as between the two parties to a bargain, or is it merely a matter of retaining existing or getting new business? Are the various schemes—including different prices, according to the purpose for which the gas is to be used, readiness to serve, and other plans involving variable rather than uniform rates—the outcome of a general desire to rise to a higher moral plane? This is the position usually claimed in connection with them; but as a matter of fact one must acknowledge that they are originated by expediency rather than anything else, and more by a desire to increase the annual turnover and the annual profit than to improve in morals. The differential rate is the child of competition; it has been rendered a matter of necessity by the exigencies of trade, and is not a mere question of ethics. Many other sellers have found themselves either compelled to adopt it or lose business; so there is no occasion for surprise that these exigencies should make themselves evident even in the horizon of the gas industry, though they have not as yet taken any important part in it.

Look at the supply of electricity as an example. No doubt the electricians would have preferred to follow the safe lines of a uniform price, and would not have suffered any qualms of conscience in so doing. But they found that they could not do a living business on it, even with the aid of the usual ideas as to discount. Frequently, their prices range through a ratio of 1 to 5 or 1 to 6; the initial or nominal price being 6d. to 8d. per unit, and the lowest or cheapest rates on the schedule 1d. to 1½d. No one will contend that there is any improvement as regards justice or fairness in this method of doing business. The real reason of adopting it is that a 1½d. scale secures a class of consumption that could not be had for 2d. Here there is simply a repetition of history. People would not use gas for motive power and cooking at 5s. per 1000 cubic feet; and so they were offered it for these purposes at 4s. But the complexion of the question of charge appears to be altering. The old form was, "What is the lowest price that will earn the dividends?" But, with the electricians, a new phase is introduced. The dividend is left to take care of itself. Business must be had on any terms; and the question is, "What are the best rates that people can be induced to pay?" Under the former *régime*, the selling department required no special attention. In the new school, it has developed into the most important department of the whole business; and commercial skill and acumen are as necessary in regard to the arranging of prices, as the technical ability called for in connection with manufacture and distribution. Gas companies, for the most part, are stopping at or near the plane of uniform prices, for the simple reason that they have no inducement to depart from it, though the question of how to deal with the motive power department in the face of acute competition, is becoming prominent in some manufacturing districts. Under the strain of competition, the seller finds himself compelled to adopt one of two courses—he must be prepared to let the business go, or else accept lower rates in regard to particular lines. Perhaps one or two special openings may offer for compensation; but as a rule it comes down to doing more business for the same or even for less profit.

The old plan of a steady business at uniform rates has a sort of soporific effect as regards extensions. There being in effect no selling department, nothing can be expected beyond what may be called the natural or unassisted growth. Artificial aids towards the working-up of new business receive no attention. If the advantages of gas had been canvassed, puffed, and pamphletted, like those of electricity, what would the sales amount to to-day, and what would be a fair average annual increase? The great defect of the old system is that it accepts the present position of the concern, and does not touch upon future possibilities. The question of the average consumption per consumer is left to take care of itself, without aid or stimulant; and yet it is more important in the real interests of the undertaking to develop and increase the rate of consumption per consumer than to increase the number of consumers. There is no speedier or more direct road towards cheap gas. The additional outlay necessitated by an increased average consumption per consumer to the extent of 20 per cent., would be very much less than that required for 20 per cent. of additional consumers. But against this, it may be urged that the additional business obtained by modern methods is not of such a staple and reliable character as that obtained in the old-fashioned way. Many people promise more than they intend to perform, under the blandishments of the canvasser, who naturally looks more at the quantity than at the quality of the business obtained; and he cannot at the best avoid bringing in a lot of useless, not to say objectionable, custom.

So, after all, there is really much to be said in favour of the old-fashioned selling basis. To command general support, the system adopted must not be too complicated. It must be simple, readily computable, and based upon a comparatively few factors, that admit of ready verification by reference to known facts. A few simple points that appeal readily to the understanding or to the sympathies of the man in the street, are more likely to assist business than elaborate semi-technical arguments even if based upon sound principles. However correct in theory, such principles admit of more than one interpretation. Both parties to the bargain will be inclined to give preference to some rudimentary plan that enables either of them to compute the quantity sold or the quantity bought, to compare it with previous transactions, or to estimate as regards extensions. The uniform system meets these requirements more directly and readily than any differential method; and it enables business to be conducted with the minimum of trouble. Considerations of this nature more than any other, induced the tradesmen of earlier and quieter days—when competition as it is now understood, did not exist—to follow the lines of an even 20 or 25 per cent. profit on every transaction, of which the system of wholesale discounts, still prevalent in many branches of trade, is a relict. This system is readily adaptable to the case of a merchant or dealer who buys at fixed prices, and can therefore get accurately at the cost of any one article or the expenditure on any one transaction. But when the vendor is also the manufacturer, the actual cost to each customer is not such an easy matter, and may become a very complicated question. In the case of any one gas consumer, the actual cost to the concern is as uncertain and debatable a matter as that of the rateable value of a gas undertaking; and although a general outline may be agreed upon, experts would differ on matters of detail. The aggregate of the whole year's working may show a satisfactory result; but the contribution of each individual thereto is a very uncertain quantity.

The gas rental clerk of the present day gets along fairly well with the aid of a few tabulated forms. He has simply to deal with such plain factors as the quantity of gas indicated by the meter, and perhaps a table of discounts. But the lot of his successor, in the days following the adoption of the new system, will be very different. The fixed computations—obvious even to the office boy—will be replaced by elaborate diagrams and forms. Instead of price per 1000 cubic feet, there will be the *quota* of establishment and distribution expenses, interest on special outlay (service, meter, &c.), cost of manufacture and supply, interest on capital according to maximum demand, and so on. To take an arbitrary example, as page 519.

If any dispute arises in respect to any one of these items, it is a matter for a conflict of experts. And the total gives no comparative or informative data. In the old system, the cost varies *pro ratâ* with the quantity consumed; in the new system several of the items are variable independent of quantity, and two-thirds only are based upon the actual consumption. The variables would presumably be determined by an analysis of the previous year's accounts; and assuming these to have been passed by a professional auditor or are otherwise officially recognized, the

OLD SYSTEM.

H. Smith. Quarter ending 190

Dr. to Gas Company.

10,000 cubic feet of gas	at 2s. 9d.	£1	7 6

NEW SYSTEM.

H. Smith. Quarter ending 190

Dr. to Gas Company.

	£	s.	d.
Cost of making and supplying 10,000 cubic feet of gas .	0	15	0
Interest on special outlay, 1¼ per cent. on £5. . . .	0	1	3
Quota of establishment and distributing expenses . .	0	3	0
Rates and taxes, 2d. per 1000 cubic feet.	0	1	8
Interest on capital to meet maximum demand, 1¾ per cent. on £20	0	7	0
	£1	7	11

questions of cost, and interest on establishment distribution, and special outlay, could be placed beyond dispute. The only means of getting at maximum consumption per hour are the capacity of the meter or service pipe; and a charge based upon these would have the objectionable effect of inducing consumers to attempt to get through with the smallest possible size.

In the above example, the cost per 1000 cubic feet approximates closely to the original or initial figure of 2s. 9d. But if the consumption was 20,000 cubic feet, and the other items remained the same, the total of the bill would be £2 4s. 7d.—equivalent to 2s. 3d. per 1000 cubic feet, and if the consumption was 30,000 cubic feet, the total would be £3 1s. 3d., or only 2s. 0½d. per 1000 cubic feet.

Electricians have not only plunged heavily for heating or power business, but they have also considered the time of usage. There is the well-known Brighton system—starting with 6d. or 7d. for the first hour, dropping to about 4d. for the second, and 2d. or less for the third; the hour being understood to mean one hour's maximum consumption per day. This system is advantageous to the sellers, because while it conveys at first reading an impression of equal division—or one-third at 7d., a second third at 4d., and the remainder at 2d.—in practice it works out very differently; the greater part of the whole being taken at 7d., a small proportion at 4d., and nothing worth speaking of at the lowest rate.

There is this point in common with all the new systems—both for gas and electricity—that they offer a large premium towards increase of consumption per consumer; and this factor must in any case bulk largely as regards the cost price of the commodity. The effect of their introduction in place of a flat-rate is that the small consumer starts with a high price, and as the rate of consumption increases, the charge advances in a smaller proportion. It offers the advantage of meeting the case of the intermittent or stand-by consumer—an illogical person who expects to have all the benefits accorded to a regular consumer without offering any equivalent in return. If the close-cutting of prices that is the usual feature of competitive trading is to be encountered, there must be a lopping off of deadheads and unprofitable customers, with a corresponding encouragement to the most promising lines. And any system which secures such a result, without at the same time introducing too much complication and ground for dispute, is likely to find favour.

Sale of Agricultural Fertilizers.

One of the last Bills to receive the Royal Assent before the rising of Parliament was that to amend the law with respect to the sale of agricultural fertilizers and feeding stuffs. The first clause provides that every person who sells for use as a fertilizer any article which has been subjected to any artificial process in the United Kingdom, or which has been imported from abroad, is to give to the purchaser an invoice stating the name of the article, and what are the respective percentages (if any) of nitrogen, soluble phosphates, insoluble phosphates, and potash contained in it; and the invoice is to have effect as a warranty by the seller that the actual percentages do not differ from those stated in the invoice beyond the prescribed limits of error. Any statement by the seller (in an invoice or an advertisement) of the percentages of the chemical and other ingredients contained in a fertilizer, is to have the effect of a warranty. The Act gives power to have a fertilizer analyzed; and penalties are imposed for breach of duty by the seller. The Act is applicable to Scotland and Ireland, and comes into operation on Jan. 1, 1907.

The World's Coal Supply.—In a recent issue of "Stahl und Eisen," an interesting estimate of the world's coal supply is given. The figures as to Germany's supply are 280,000 million tons, which will last, at the present rate of consumption, a couple of thousand years. The coal deposits of Great Britain and Ireland are put at 193,000 million tons, with an annual consumption of twice that of Germany. The estimated coal deposit of Belgium is 23,000 million tons, of France 19,000 millions, Austria 17,000 millions, and Russia 40,000 millions. North America's coal deposits are reckoned by the same authority at 681,000 million tons. The total for all Europe is placed at 700,000 million tons. Asia is conceded to have much larger deposits, which cannot even approximately be estimated.

TEN YEARS SINCE AND TEN YEARS HENCE.

IRISH GAS-SELLING METHODS OF THE PAST AND FUTURE.

By J. F. DAVIES, of Manchester.

[**A Paper read before the Irish Association of Gas Managers, Aug. 14.**]

The up-to-date gas manager of to-day is a man of many and varied capacities. He is not merely concerned with the best way of making good gas and cheap. He is a seller of gas as well as a maker of it; and the ways and means of disposing of his make of gas are probably scarcely less important in his estimation, nor less frequent in his thoughts, than the more technical matters that lie in the course between the retort-bench and the gasholder. At meetings like the present, there is seldom any lack of interesting and helpful papers bearing on the manufacture of gas; and into that branch it would be equally foolish and presumptuous for a mere commercial man like myself to intrude—particularly before a body of specialists such as I have the honour to address. It is the other chief branch of the gas authority's business with which I may claim to be intimately acquainted—the perfecting of the present means for increasing the sale of gas, and the developing of fresh methods for the same purpose; and it is in this connection that I am now venturing to briefly occupy your attention.

The original object of gas manufacture was, of course, for purposes of lighting; but it has long been recognized that while light is wanted daily for a few hours only, heat is in demand for many uses during all the working, and indeed all the waking, hours of the day. Hence the gas-bracket and gasalier were soon followed by the gas-stove; crude at first, but gradually evolved into the perfected appliances of to-day; adapted to all requirements both for cooking and heating. I propose to recall in a sentence or two the progress that has been made, particularly in Ireland, during the last few years, in developing the sales of gas by means of gas-stoves, and to follow this brief review by indicating the lines on which, in my opinion, that same development will most likely and most successfully advance during the next few years.

Ten years ago the number of gas-stoves in use in Ireland was very small indeed. Unfortunately, no statistics are on record going so far back; but the fact will be readily confirmed by all those whose recollection goes as far back as 1895. At that time the position in England, while very far short of what it is now, was much in advance of that in Ireland. The reasons are simple enough. Gas was very dear in most Irish towns; most gas authorities made very high charges for fixing gas-stoves; and the smaller authorities were not suitably equipped for economically running a gas-stove department—including such work as the cleaning of returned cookers and so forth. But once the great practical advantage to the gas authority of taking up the stove business was realized, the Irish gas manager was no whit behind his English brethren in quickly grasping the situation, and effectively dealing with it. About the year 1897, the new ideas began to make themselves felt; and the next year or two saw such an advance that, in 1900, the percentage of gas-cooking stoves as compared with the number of consumers was a little over 14 per cent. In the same year in England and Wales the percentage of cookers as compared with consumers was 15·5. So that Ireland's 14 per cent. makes a good second; while Scotland lags behind with under 6 per cent. The figures were:

England and Wales. .	Consumers,	4,029,004	Cookers,	624,787
Scotland	,,	571,788	,,	33,794
Ireland	,,	87,361	,,	12,335

By the time another five-year period had elapsed—namely 1905—the further development of the figures showed that Ireland's percentage of cookers to consumers had largely increased—viz., from 14 to 24·2 per cent. But good though this degree of progress may be, it has failed to keep pace with the advance in either division of the Sister Island during the same period; for England's 15·5 per cent. of 1900 has grown to 36·6 per cent. (much more than double) in 1905; and Scotland shows 11·6 per cent., or nearly double its bare 6 per cent. of 1900. The exact figures for 1905 are as follows:

England and Wales. .	Consumers,	4,877,437	Cookers,	1,787,490
Scotland	,,	699,171	,,	80,934
Ireland	,,	134,277	,,	32,452

Look at the figures another way. In the five years ending 1905, England has added to its consumers 848,433, or an advance of 21·5 per cent.; while it has increased the number of gas-cookers in use by 1,162,703, or an advance of no less than 186 per cent. Scotland has added to its consumers 127,383—an advance of 22 per cent. (just ½ per cent. over the English percentage), and has increased its gas-cookers in use by 47,140, or an advance of 139 per cent. Ireland has added 46,916 consumers, or an advance of 53·7 per cent., and has in use 20,117 additional cookers, or an advance of 163 per cent. In other words, while Ireland in five years has more than doubled the number of her consumers, she has more than trebled the number of gas-cookers in use. This sounds very well; but in comparing the rates of increase, I need hardly remind you that a very important point is the figure we start from. In the case of Ireland, we started with so low a figure that the doubling or even trebling of it does not mean a very huge one; and the fact that Ireland has only 24·2 cookers per 100 consumers, while England's percentage is 36·6 (or half as-

many again) proves, as I think you will all readily agree, that in Ireland there is still room for a vigorous campaign to further develop gas sales in this direction.

As regards the methods that should characterize such a campaign, most of these are already well known by experience. The progress made up till now, as indicated by the figures I have given, is due to the foresight and effort of a number of the leading gas authorities in Ireland; and these efforts have followed the usual lines. There has been a steady reduction in the price of gas in most towns; in some cases a special reduced rate for gas for use with stoves; and there have been the usual arrangements in most instances for hiring-out cookers on hire-purchase and—much better for all parties—on simple hire, with in some cases free fixing as well.

The present state of development in the use of gas-cookers, great and progressive though it is, has yet, I believe, a very great future before it. Even in England, with 36 per cent. of its consumers using gas-cookers, this business has yet far to go; for I hold that practically every domestic gas consumer ought, in his own interest, to do his cooking by gas. And if England has still far to go, Ireland, with its 24 per cent., has even further. The business in slot-cooker and lighting installations is now growingly popular both with gas authorities and consumers all over the land; and it is responsible for great developments in the business done by an increasing number of gas authorities both large and small. In one moderate-sized town, for example, some 6000 installations have been put in during the past four years, and the work still goes steadily on. The slot-meter and its sister apparatus the slot-cooker have conquered whole provinces of territory for the gas authorities, and brought under their control whole regiments of subjects—I should say consumers. It has done this largely owing to the peculiar conditions prevailing in the trade—conditions which are highly favourable and eminently safe for the gas authority.

So much for the past. Now let us deal for a little with present conditions and future prospects. The figures I have given you deal with cookers only, for the reason that there are no figures available regarding other gas apparatus. Considerable progress, however, has been made by gas authorities in England in recent years in developing the trade in gas-heating stoves of various types. In Ireland the gas-heating business has only just begun to make progress. What progress has been made on this side of the Channel and the other, is the result of the enterprise of certain gas authorities who have recognized the possibilities of gas-heating apparatus in developing gas sales, and have seen it to be well worth their while to meet their consumers liberally in the way of providing them with such apparatus. It is also, if I may be permitted to say so, due in its degree to the exertions, in the way of advertising, by the various firms manufacturing these goods.

Now, gentlemen, what are to be the conditions of the gas-stove business in the next ten years—particularly on this side of the Channel. A well-known statesman used to say, "Never prophesy unless you know." I am not a prophet nor the son of a prophet, and I do not pretend to know; but there are two things which we, whose interests are bound up with the gas industry, can do as regards the future. In the first place, we can make up our minds what ought to be, and in the next place we can set ourselves to make sure that what ought to be will be.

The Irish gas consumer particularly ought to use gas both for cooking and heating as well as lighting. I need only point to the high prices ruling in Ireland for good house coal to show how clearly this will make for economy in the consumer's interest. Already a healthy and steady demand for domestic gas appliances has set in in Ireland; and there is no reason why a very large business should not be done in the near future. The indispensable factor in the situation is the gas authority. Whenever a gas authority sees how much its interest is bound up with this development, it acts; and speedy success follows. Where does its interest come in? As regards cookers, the question is beyond the need of any reply—the facts speak for themselves.

There is one point further in regard to cookers, to which I should like to make passing reference. While the last few years have witnessed a great development of gas selling through the general adoption of the cheap "slot" cooker, and the putting out of these by many gas authorities upon their districts on nominal terms, and while there yet remains a vast field to be exploited in this direction, I have long felt that there is another class of consumer, whose requirements in the way of cookery are of a more elaborate description—calling for the highest grade of cooking apparatus with its greater capacity and variety of appliances. While, obviously, this class is much less numerous than the one catered for by the "slot" cooker, yet, on the other hand, it has to be borne in mind that, so far as the gas authority is concerned, a much larger quantity of gas is used per consumer, and at the same time the consumer is of a much more reliable type; and in any case there is, of course, far less trouble to the gas authority in selling a larger quantity of gas to a smaller and more reliable body of consumers.

As regards gas-heating stoves, let it be remembered that while "one house one cooker" is a maxim that can hardly be improved upon, no such limit applies to gas-heating stoves. There is already a variety of apparatus suited to every house, to every apartment, to every condition, and to every pocket. A gas authority can speak with a degree of weight which a mere maker or seller of stoves cannot command. They can prove to their consumers the economy of gas-fires; they can advise them as to the choice of stove for each apartment; and they can use their great local influence to get housebuilders to make provision in every apartment for gas heating. They also can, and I hold should, cultivate the interest and confidence of architects to a degree which has not hitherto been generally attempted; persuade these gentlemen as to the great facilities offered to their profession by the new types of gas-heating apparatus; and induce them to see the advantage of specifying this class of gas apparatus for buildings, both domestic and public, which they may be at the time designing.

Have any of my audience ever put to themselves the question, "Why should there not be slot gas-fires as well as slot gas-cookers?" True, there are many gas-fires in the market at low enough prices; but their heating power has been as low as their price. The gas-fire of the future, I firmly believe, will be a fire as cheap in proportion as a slot-cooker, but which—though, like the slot-cooker, not professing to have the luxuries of detail found in the high-class stoves—will give good practical results on a lower scale of consumption than the more costly gas-fires. Given such an apparatus at such a low figure, gas authorities will then have the golden opportunity within their grasp. Let them place such a fire broadcast among their consumers on as easy conditions as the more advanced of them place slot-cookers at present—not one stove to every house, but one stove to every room—let them include one or two such slot-fires in every installation they fit up, and gas sales will mount up with wings. I believe a slot gas-fire is bound to be one of the leading features of the gas industry in the immediate future. I have no doubt that the appearance of such a stove will be awaited by the gas trade with interest and greeted with enthusiasm; and one may safely predict that round it will centre a new development in gas heating in a direction and upon a scale hitherto unthought of.

Still dealing for a moment with gas-fires, my experience is that at present the gas-heating trade is practically over by Christmas. The general impression seems to be that the cold weather ends with December. I have gone to the trouble of making very careful researches in the Meteorological returns, and perhaps it may be a surprise to some to learn that, instead of the last three months of the year being the coldest, the average temperature actually gets lower during January, February, and March—not a little lower, but a good deal lower.

Mean Temperature for the Last Eighteen Years, as Recorded for the Midland Counties of England.

Jan.	Feb.	March.	Oct.	Nov.	Dec.
37·5	37·9	40·7	48·1	42·9	38·5

Year 1895.

	Jan.	Feb.	March.	Oct.	Nov.	Dec.
Dublin	36·4	33·7	43·1	49·4	44·2	42·2
Parsonstown	33·9	31·0	43·0	44·1	44·2	40·0
Valencia	39·6	37·0	45·1	48·9	47·4	45·8
Roche's Point	39·0	36·9	44·9	49·1	47·7	45·1

Year 1900.

	Jan.	Feb.	March.	Oct.	Nov.	Dec.
Dublin	43·4	36·5	40·3	50·2	46·1	46·1
Parsonstown	40·3	34·3	38·1	47·8	42·8	44·3
Valencia	44·9	39·9	41·8	51·5	46·8	48·0
Roche's Point	44·6	39·8	41·9	51·6	46·9	47·6

Year 1905.

	Jan.	Feb.	March.	Oct.	Nov.	Dec.
Dublin	43·8	43 8	45·3	47·4	43·2	47·2
Parsonstown	41·8	41·2	42·7	44·4	39·0	44·9
Valencia	46·2	44·8	45·1	48·4	44·1	47·8
Roche's Point	45·2	44·2	45·0	48·2	43·6	46·9

The figures in the table I have had prepared bring this out clearly; and it will be seen that I have not only given the general figures for England, but those taken at the Irish observatories. All tell the same tale. The importance of the bearing of these statistics cannot be exaggerated. They show clearly that, instead of folding our hands by Christmas time, as if the heating-stove demand were over, we should be at the height of our effort in this line. January, February, and March ought to see large numbers of heating stoves being placed; and the cold spring months should witness some of the largest sales of gas for heating purposes. On this point, a word to the wise (in other words, to the gas authorities) will, I hope, be sufficient.

But it is not only in domestic heating that the future lies so largely with gas. Its use for heating every variety of warehouses, shops, offices, and public buildings has made remarkable progress; and in time to come it promises to attain truly vast proportions. This development centres to a large extent round the gas-heated radiator, which was introduced in its early form by a well-known firm of makers some sixteen years ago, and has since been steadily developed in a succession of similar apparatus from the same source. The gas-radiator has long enjoyed a wide popularity for heating premises of the classes I have mentioned; and in its latest evolution, the gas-steam radiator, there is no limit in this direction to its uses and prospects. Appliances of this class are in use in the Houses of Parliament, in Smith's bookstall premises throughout the railways, H.M. Office of Works, the Mansion House, H.M. Inland Revenue Office, the General Post Office, St. Martin's-le-Grand, the Corporation of the City of London, Scotland Yard, the Guildhall, Royal Albert Hall,

London College of Music, Ye Mecca Cafés (at all branches), the Pavilion, Lyric, Royalty, Haymarket, and Terry's Theatres, and very many leading churches, banks, insurance companies, and wholesale premises all over the country.

With so perfected an apparatus, the old objection to flueless gas-stoves, for example, become meaningless; and it is really time we heard the end of it. The automatic gas-valve, with its minimized consumption, ensures both the lowest amount of combustion products in the apartment, and the lowest fuel cost. It is an interesting fact that to heat any building in this way, burns less gas than is generally required to light it with the ordinary incandescent burners; and yet people would never dream of objecting to gas-lighting appliances because they have no flues. Add to these points the further fact that—as Sir Oliver Lodge, the well-known scientist, has repeatedly pointed out—the general prevalence of gas heating would go far to cure the fog nuisance in large towns, and I think it will be agreed that gas authorities can make an excellent case for the adopting of such apparatus by their consumers, and may well consider seriously the letting out of such apparatus. A gas-steam radiator is the longest-lived gas-stove in existence. Its life is precisely, broadly speaking, that of an ordinary steam-boiler. It is practically indestructible; and I do not know of one such apparatus having yet required repair through wear and tear.

Then the principle of the automatic gas-valve has now been applied to the circulating gas-heated boiler; and here another wide and fresh field is opening up. I need only allude in a word to the objections that have hindered the progress of the geyser, or instantaneous heater. The quantity of gas needed to heat so much water in so short time naturally involves great expense for gas, and a large output of combustion products into the atmosphere; and as these appliances are usually fitted in very small rooms—such as bathrooms—this class of heater has not inspired general trust. But if you are not going to have the instantaneous principle, you must have the automatic principle; for anything that needs the gas to be turned up or down by hand will either be never ready to supply hot water when wanted, or the turning down of the gas will soon be found too great a bore, and the full flame will go on all the time, simply wasting gas. To give a full flame till the whole water is heated, then automatically turn it down till just high enough to maintain the temperature, turn it up automatically the moment any water is drawn off, and down once more when the temperature has again been levelled up—that is what all gas water-heaters of the future should do. With such an apparatus, requiring only 7 cubic feet of gas to keep 20 gallons of water at a heat of 150°, the gas authority can go not only to builders and occupiers of private houses, but to restaurants, public and railway lavatories, fire-brigade stations, hairdressers' shops, &c., and offer the very thing that is required for such places. Needless to say, every 1000 feet of gas used in this way is a clear addition to any gas authority's output.

There are many special gas appliances made by the various stove makers—such as appliances for laboratories, workshops, tailors' shops, bakers' shops, laundries, hotels, and so forth—in which I suggest greater interest might be taken, and more effort made to spread their use. Indeed, I think I may venture to claim on behalf of the various firms connected with the stove-making industry, that they have not been lacking either in inventiveness or enterprise, and that, with the wide range of apparatus now available for so many uses, and appealing to such a variety of present and possible consumers, there is plenty of room for a far larger extension of the gas industry in many directions than has yet been attempted; and when there is added to this such fresh advances in apparatus as I have ventured to foreshadow, I believe that the next ten years will witness a degree of progress such as will astonish the faint-hearted and exceed the hopes of the sanguine, so unbounded is my faith in the future of the gas industry.

Certain conditions, however, are essential. The sellers of gas and the sellers of gas-consuming apparatus must continue to co-operate in fostering the business. Enterprise must reign; large views must be taken; gas must be cheapened wherever possible; and gas apparatus must be put out on the districts such as will enable every consumer to burn the last foot of gas he can profitably use. The gospel of gas and its many uses must be proclaimed in public and in private, in season and out of season—in fact, it never is out of season; and the public must be taught that gas was never half so widely useful in the past as it is going to be in the next ten years.

Discussion.

The PRESIDENT said the subject was one which came home very much to all of them, and he felt that the hints Mr. Davies had given them were of great worth. It was a very interesting, and really a most profitable paper.

Mr. C. B. Tully (London) thought that he was one of the first in Ireland to adopt differential rates for gas. Some sixteen years ago, he formed the opinion that to make the sale of cooking and heating gas a success, it must be supplied at such a rate as to enable consumers to use a stove with economy. At that time, he fixed the price, and his Directors adopted it, at 2s. 10d. per 1000 cubic feet. They went on for a number of years at this figure, and there was no doubt that they made a decided success of their cooking and heating business in Sligo. He was still of the same opinion—that gas must be supplied at a price not exceeding 3s. per 1000 cubic feet. Since he had been in London, he had had to pay for gas himself, and he could speak as to that. In the first house he was in in London, he paid 3s. 6d. per 1000 cubic feet. He found that his gas bills were very high, and the gas-stoves very expensive. He moved a short time ago, and was now paying 2s. 8d. per 1000 cubic feet; and his wife told him that she considered the gas reasonable, and the use of it very cheap. There was no doubt but that, with gas at 2s. 8d., they could use it liberally—there was no stint about the thing at all. But when they were paying 3s. 6d., it was screwed down, and every economy was practised. Mr. Brodie had mentioned that his gas cost him 2s. per 1000 cubic feet. Would it not be better to sell gas at 3s., and make the extra shilling of profit? It was better to make 5 or 10 per cent. profit than make nothing. He had gone into the case of the works at Kinsale, and he found that any extra gas which was made cost them about 1s. 6d. per 1000 cubic feet. That was to say, they could make about 2 million cubic feet per annum without any extra cost for carbonizing labour, and without any extra cost for management, Directors' fees, rents, rates, or taxes; and that they could make this extra 2 millions for about 1s. 6d. per 1000 cubic feet. They could well afford to sell this gas at 3s. per 1000 cubic feet; and if they should do so, they would not have the stoves sent back again—they would make a complete success of the business. Another thing which struck him was that last year they nearly doubled the pressure in the town, with the result that the leakage went up from 8 to 12¾ per cent. The entire leakage brought about by the higher pressure amounted to 297,000 cubic feet. Against this, they sold 225,000 cubic feet more of gas, at 5s. 7d. per 1000 cubic feet. The result of this extra leakage and extra pressure was a considerable profit to the Company, so that it would pay even to have an increase of leakage.

Mr. J. G. TOOMS (Waterford) said that experts differed as to the valuation of gas-works according to which side they belonged; and he begged to differ from Mr. Tully when he spoke of the gas to be used being increased from 2s. to 3s. He would say from 4s. to 5s. But where the gas was more than 4s. 2d. or 4s. 6d. per 1000 cubic feet, then there should be a differential rate for cookers and heaters. Mr. Davies had given them the statement that cookers first became popular in Ireland some eight years ago. He took up the management of quite a small gas-works, and he was very successful in introducing cookers in the town. First, they had an exhibition, and, mainly through the force of his own personal solicitation, they got orders for a dozen cookers on approval. They bought these cookers from the makers, and fixed them on the condition that they were to come back in a month, or two months, if they did not give the satisfaction guaranteed. They did not leave the cookers entirely to themselves, after being placed. They had men regularly checking the consumption of gas; and if they found the consumption in their opinion excessive, they warned the mistress or the master of the house that the gas was being wasted by the servants—in fact, they followed the cookers about, and the end was that they were all bought, or agreed to be brought, on a half-yearly system of payment. They did not need to push cookers after that; they pushed themselves. The result was that, in this small town, the consumption of gas was exactly doubled in two years. Mr. Davies gave the increase in Ireland in 1905 as being 24 per cent. He found, on looking up his returns, that they had 1758 consumers, and 1058 cookers in use—that was, 60 per cent. of their consumers were using cookers. It might be that this figure should be rather increased, on account of cookers which were sold more than five years ago, and which had been lost sight of, but which were still in use; but there was certainly not less than 60 per cent. of the consumers in the Clty of Waterford using cookers. Had it not been for this, he felt certain that the Waterford Gas Company would have been in a precarious condition, because over 90 per cent. of their lighting was now by incandescent burners, and the lighting consumption had materially decreased, although extra consumers had been connected of late years. Between 1900 and 1904, he thought he was correct in saying that they had upwards of 40 per cent. increase in consumption. Since then, however, the increase had only been equal to about 3 per cent., although they had fixed 600 cookers during the past two years; and, from investigations he had recently made, he was satisfied that all of these cookers were being used in a manner remunerative to the Company. He thought, having had experience, that no one had a better opportunity for making his individuality felt, in this and other departments, than the manager of a small works. He was in such frequent intercourse with his consumers that he knew every one of them; and if he were desirous of pushing his cookers, and set about it in the right way, he felt sure he would be able to do all that Mr. Davies thought he had occasion to do. Mr. Davies spoke about heating stoves not having been taken up in the way they ought to have been. His opinion of the reason for this was that in so many instances they found heating stoves improperly fixed—by plumbers, and by careless fitters of their own sometimes. He had had occasion, many times, to entirely re-fix heating stoves in fixed-in grates. The chief source of trouble was that a gas-heating stove was adopted to cure a smoky chimney. Another source of trouble was the inadequate supply of gas. He had, during the last few months, endeavoured to push special meters for gas-stoves; but he could not say that he had been altogether successful with them. His experience had been—and he presumed Mr. Davies would bear him out—that radiators could not be used unless there was fairly good ventilation in the rooms

in which they were placed. They should not be fixed in small, pokey rooms. Within the past twelve months, they had opened show-rooms in Waterford; and they had taken occasion to show hot and cold water supplies, along with geysers, with the result that they had received orders for a number of geysers for public institutions. To his mind, in the development of business in gas appliances, they required to adopt more commercial methods. He did not think that the price of gas was any obstacle to getting a stove in; they had simply to keep at the consumers, and bring the advantages of the particular apparatus continually under their notice. His experience was that cheap gas was not a *sine qua non*—it was the service they gave to the public, in looking after their apparatus and giving them prompt and careful attention.

Mr. A. A. Scrivener (Dublin) agreed that the business needed personal attention—the looking to the individual requirements of their customers, finding out exactly what they wanted, and seeing that they got it. In many cases, more particularly in the smaller towns, people knew very little about gas, except that it was useful for lighting. They did not know much about gas-cookers, and they need not expect that they would come in and buy them. But if they took the trouble to show them how gas cooking would be a sure advantage to them, they would find that consumers would, in their own interest, take to the cookers. If they gave consumers an opportunity of trying them, and got a few stoves planted, the rest would follow as a matter of course. He thought there had been more progress made in Ireland than the figures in the paper conveyed. It was very difficult to get any statistics, particularly relating to many of the gas-works in Ireland; but the cookers referred to—well, he was himself responsible, indirectly, for more than were mentioned. It was quite true that the colder weather came after Christmas time. The late Chairman of the Company that he represented—the late Mr. Richmond—took the trouble to bring out the same result a few years ago. Ireland was different from England in this respect—that in England and Wales they had larger industries, and in a small town a big works might come and start, and then up went the gas consumption. They had very little of this in Ireland. In many Irish towns the manager saw his population gradually diminishing; and his problem was how to keep up his consumption. He had got to do this by means of gas-stoves, gas-engines, and similar appliances; and if he could do it without increase of manufacturing plant, so much the better. This was the meaning of a day and a summer consumption—he scored at both ends.

The President asked if Mr. Scrivener had had experience with cheap gas.

Mr. Scrivener said he could not call Dublin gas cheap. The price in the city was not out of the way; but Dublin was a very straggling place. Roughly, the gas was supplied over a district extending to twenty miles round; and the cost of supplying gas in the outlying neighbourhood was, naturally, more than in the case of a small town, where all the consumers were pretty compact together. The further away, the more expensive was the gas. As regarded gas-fires, he thought Mr. Tooms had hit the nail on the head. With them, it was very largely a matter of fixing. A few years ago, they simply connected gas-pipes; and in many cases they found that the gas-fire was put in with the idea of curing a smoky chimney. Of course, if they had any idea of that, they told the people at once that it was no place for a gas-fire—that they must cure the chimney first. They found that the ventilation was too strong, or not strong enough. In some cases the heat was all drawn up the chimney; in others, the ventilation was not sufficient, and it had an effect on the burner, and on the heating of the room. So now they made it a point of fitting every gas-fire with a simple sheet-iron protection; and they found that this made a great improvement in the fire.

The President remarked that he found that the price of gas really did not affect the business.

Mr. J. G. Tooms (Waterford) said that a few years ago he was serving the Harrogate Gas Company. Anyone who could afford to live there, could afford to burn gas day and night; but the Company went to enormous trouble to give entire satisfaction. They would not leave even a chance of failure. Their whole idea seemed to be that if they could not make it a success, the stove must come back. The consequence was that throughout Harrogate they never heard a complaint about the air being too dry or the like. In other towns he knew, the prevailing idea was that, in fixing a gas-stove, they were almost certain to injure the health of the people in the house. Until this feeling was eradicated, they certainly would not make much progress.

Mr. T. J. Reid (Ballina) said the heartiest thanks of the Association were due to Mr. Davies for his paper. It was seldom that commercial men favoured the Association with papers. He did not see any reason why the commercial element should not be made use of as well as the more technical membership. They were all at one with Mr. Davies. He did not suppose there was a gas manager who was not only anxious, but, it might be, over-anxious, to seize every opportunity of putting in appliances by which he could increase his sales. They might have expected from Mr. Davies some information by which they would be able to carry this into effect. But, in reading over the paper, he did not see very much information given as to how they were to effect these changes in the future. The author paid a certain amount of tribute to Irish managers for their enterprise; but he stopped short at a certain point. They had done something in the past; but they had not done enough, and he seemed to have a sort of dread that they would not do enough in the future. He hoped Mr. Davies would be disappointed in this. The fact that an increase in the output of stoves, both for heating and cooking, had taken place in the larger concerns in Ireland, was only to be expected. Mr. Davies seemed to be entirely ignorant of the conditions which prevailed in small provincial towns in Ireland. He did not seem to know the people with whom he had to deal. Some of them would not have a stove at any price; and it was true that it was not altogether the price of gas that prevented people in Ireland from getting gas-stoves—it was the opinion that it would be detrimental to their health. With a sufficient amount of reiteration, they might hope to arrive at a better understanding in (say) ten years' time. About ten years ago, as a matter of fact, he began to take in cookers. He supplied a man with a large one, costing something like £9. After about a fortnight, he asked the man how the cooker was getting on, and he said splendid. The man took him into the house—into the kitchen, where the stove was—and showed him the cooker. On the shelves of it were reposing the wife's hat, and the like. They had evidently mistaken the use of the cooker, and were making a wardrobe of it. It was far harder to get such apparatus introduced in Ireland than it was in England. They had not the same class of people. In England they had mechanics earning 25s. or 30s. a week, who used a great deal of gas. Their labouring classes could not afford to do that. They gave every encouragement to the use of cookers and heaters. They supplied them free, if a sufficient quantity of gas were used; but he was sorry to say that a good many people thought they were not things to be used at all—that they were detrimental to health, and expensive. He entirely agreed with what Mr. Tully said as to differential prices. The gas managers were too hide-bound in the matter of price. They ought to introduce the commercial element of bargaining into the sale of gas. He made a bargain with every man individually. Mr. Davies seemed to think that gas managers in Ireland did not grasp the possibilities of stoves and cookers as the manufacturers did. He joined issue with this entirely. He did not say it outright; but he certainly did it by suggestion. The gas managers of Ireland were sufficiently enterprising; but they would not run after everything that was put upon the market. In some of the smaller towns of Ireland, too dear cookers had been tried. They were not great meat-eaters in the provincial parts of Ireland, and therefore a cooker with a large oven was not required. What they wanted was a thing on which they could put a frying pan; and therefore the proper cooker and the proper fire had yet to be made. He felt sure that gas apparatus manufacturers, under the guidance and instruction of such commercial men as Mr. Davies and Mr. Scrivener, would soon set about making the right article for Irish provincial use. He did not see why they should not be able to get a greatly increased business. He considered they had all been making a mistake with regard to the pressure of the gas. About three years ago, he suggested that gas ought to be supplied at a considerably higher pressure; and he had no doubt whatever that this would come to pass.

Mr. J. Paterson (Queenstown) contended that gas managers were more anxious to sell than to make gas. There was no trouble in making gas; the trouble was in selling it. They had a different class of people to deal with in Ireland from what there was in England. Taking the figures all round, he thought the percentage for Ireland was very creditable. Mr. Davies spoke of the price of coal. He could take him to many places in Ireland where coal was cheaper than in many parts of England; so that gas would need to be sold very cheaply for heating before it could compete with coal. It could not do so unless it could be sold at not more than 2s. per 1000 cubic feet. Mr. Davies remarked that there were cooking and heating stoves made to suit every house and every apartment, and to suit every pocket. He did not think the fire was made yet which would suit every pocket. Unless they could sell gas at certainly not more than 2s. per 1000 cubic feet, they could not pretend to heat up premises as cheaply as could be done with coal. They would have to give consumers a very low rate, and slot meters to suit the people they had to deal with.

Mr. R. Young (Youghal) had never yet found a gas-fire which was anything nearly as cheap as coal. Supposing they were to fix a gas-fire and slot-meter, and set the meter at 25 cubic feet for 1d., most fires would consume this in less than an hour, though he knew there were some which actually worked at 15 cubic feet per hour, and gave a fairly bright heat at that. Could Mr. Davies give them any proof that (say) a church or a large hall could be heated by a gas-radiator with less gas than would be required for lighting it with incandescent burners? If such were the case, it would pay all the churches in Youghal to discard their present heating arrangements with coke, and instal gas heating—in fact, some of them paid twice as much for coke as they did for gas.

Mr. J. E. Enright (Tralee) said that, from his experience in a few towns in Ireland, he found that if they had a stove on something like the boiler system it would suit. They did not want an oven. If some good came of the discussion in this way, they might be able to put Mr. Davies' lessons into practice, and double or treble their consumption. But he thought the stove manufacturers would have to help them in some way, and give them something which would suit them. The price of gas had not everything to do with the consumption. In his experience, people who had cookers, if they found the utility of them, would take them even although they considered them to be a little

dearer. He did not think that fires had yet been brought to a point which admitted of their universal adoption. They could not put gas-fires into grates except at a great expense; and thus stove makers had yet a good deal to do.

Mr. DAVIES' reply to the discussion, was, on account of the lateness of the hour, written by him, and communicated to the Press. It was in the following terms: Mr. Tooms had told them what could be done in a small Irish town by liberally treating the consumers, as was done at Carrick-on-Suir, where, in a few years, the consumption was doubled by the use of cookers; and he had told them that at Waterford 60 per cent. of the consumers cooked by gas. This was very satisfactory; and he was sure there were not very many towns on the other side of the water that could show a better percentage. Mr. Tooms was perfectly right when he said that the complaints from consumers regarding the unsatisfactoriness of gas-fires was mainly due to bad fitting. Some gas-fitters had absolutely no idea how to fit gas-fires. Many of them never considered anything at all about ventilation; and, further, the chief fault lay in the fact that a suitable fire was not selected for the position it was intended for. Mr. Tooms considered radiators to be most satisfactory, but had found that they were not satisfactory in small rooms which were not well ventilated. He need hardly point out that such powerful heaters were not intended to be used in small places such as living rooms. In reply to Mr. Reid, he might say he had endeavoured to deal with the past, present, and future of the gas-stove trade; but Mr. Reid did not think that his paper was altogether in accordance with its title. He was not prepared to admit that he was not in touch with the wants of Irish consumers in the country districts, for during the past eight years it had been his pleasure to come into direct touch with consumers in all parts of Ireland; and where the gas companies had laid themselves out for the placing of gas apparatus, the results had been most satisfactory. At Magherafelt, 23 per cent. of the consumers cooked by gas; at Bagnalstown, 55 per cent.; at Mallow, 63 per cent.; at Carrick-on-Suir, 50 per cent.; at Fermoy, 40 per cent.; at Tipperary, 56 per cent.; at Kilkenny, 40 per cent. He was therefore convinced that, as such highly satisfactory results had been secured in the towns mentioned, by liberally meeting the consumers and by regularly soliciting orders, the same could be done in other districts. This suggestion for improving the gas-stove trade in Ireland had probably escaped Mr. Reid's notice. He would most respectfully refer him to his remarks, where he suggested that, in his opinion, the large consumer should be encouraged to use gas for more general purposes; that they should all cultivate the interest of architects; that they should endeavour to secure the heating of large buildings, now that radiators had been brought to such a pitch of perfection; that slot gas-fires should be fitted with installations; and that, instead of resting at Christmas, as though the heating-stove trade was over, they should redouble their efforts during the quarter of the year January, February, and March. And, further, he was confident that there was a vast field for the circulating hot-water boiler, such as he described in his paper. Mr. Paterson and Mr. Young complained of the extravagance of gas-fires, and Mr. Paterson, particularly, mentioned that he did not think there were gas-fires suited to every pocket. He thought he might betray a secret so far as to say that lately he had had a gas-fire shown to him, burning under test—a fire which burned as low as 14 cubic feet of gas per hour—which had effective provision for adjusting the supply, both of gas and air, and which equalled, in size and appearance, and also in heat and brightness, the best high-class fires he had ever seen. This fire, he believed, would revolutionize the gas-fire trade; and he thought the price would be well under a sovereign. Mr. Young asked how a building could be heated with no more gas than was required to light it. A building (say) 50 ft. by 30 ft. by 16 ft., containing 24,000 cubic feet of space, would require three ten-section radiators of 39 inches to effectually heat it, and the average gas consumption was 16 cubic feet for each radiator, equalling 48 cubic feet. Lighting the same building with incandescent gas-lights would require twelve burners, each consuming (say) 4 cubic feet of gas per hour, equalling 48 cubic feet. It would therefore be seen that with the system of gas-heated radiators, no more gas was required for heating than would be necessary for lighting. Mr. Enright spoke of a cheap hot plate. Well, there was a cheap hot plate for the use of small consumers, hundreds of which were in use in Cork, and which gave very satisfactory results.

Mr. George Anderson, who was the Secretary of the Thirsk District Water Company, and whose death occurred on the 17th of February, at the age of 68, left estate of the value of £6830.

The Home Secretary has appointed a Departmental Committee to inquire and report what diseases and injuries, other than injuries by accident, are due to industrial occupations, are distinguishable as such, and can properly be added to diseases enumerated in the third schedule of the Workmen's Compensation Bill, 1906, so as to entitle to compensation. The Committee is composed as follows: Mr. Herbert Samuel, M.P., Parliamentary Under-Secretary of State for the Home Department (to be Chairman); Dr. Clifford Allbutt, F.R.S., Regius Professor of Physics at Cambridge; Mr. H. H. Cunynghame, C.B., Assistant Under-Secretary of State for the Home Department; and Dr. T. M. Legge, Medical Inspector of Factories. The Secretary is Mr. F. L. D. Elliott, of the Home Office.

RADIATION FROM INCANDESCENT MANTLES.

Mr. J. Swinburne's British Association Paper.

In the last number of the "JOURNAL" (p. 441), we briefly noticed a paper on the above subject, read by Mr. James Swinburne at the recent meeting of the British Association. We have since received from the author the full text of the paper, which we are pleased to give.

The ordinary explanation of the great luminous efficiency of the gas-mantle is that rare earths have a property of selective radiation, in virtue of which they send out a larger proportion of their radiant energy in the form of light than ordinary hot bodies. The rare earths also suffer from "luminescence," which may be a disease on its own account, or a sympton of catalysis, or polarization, or something. Another explanation, first given, I believe, by Ram ("Incandescent Lamp," p. 196), is that the bunsen flame is really very hot, and that the mantle is of such low emissivity that it gets rid of so little power that there is slight difference of temperature between it and the flame, and it is therefore hot enough to give the light by pure temperature radiation without any anomaly.

One reason why the simple temperature explanation has been much questioned, and generally rejected, is that the temperature of the bunsen flame is generally taken to be much lower than it is. It is generally measured by means of platinum wires or thermo-couples. These can never rise to the real temperature of the flame, as they are radiating, and must therefore be taking in heat by conduction, in which case they must be cooler than their surroundings. The simple temperature explanation fits the phenomena. If pure thoria has low emissivity, it will rise to a temperature near that of the shell of flame bathing it. Having low emissivity, it will then give out little light; but the light will have a larger proportion of visible and refrangible rays. If a very little of a body with a high emissivity be added, radiation will increase, but the temperature of the mantle will fall, as there must be a steeper heat-gradient to supply it. The total radiation is then increased; and though the proportion which is luminous will be diminished, the total light will be augmented. Further addition of the emissive substance increases the total radiation and reduces the temperature until the light given is less even than with pure thoria.

It may be urged against this that thoria, zirconia, and alumina, for example, are white, and therefore may be expected to have little luminosity when hot, as a white body, being a good reflector, should be a bad emitter. But ceria, if pure, is also white, about as white as thoria, and therefore should have the same order of emissivity as thoria. Adding 1½ per cent. of it cannot, therefore, increase the emissivity of the mantle very much. But it does not follow that a body which is white when cold necessarily remains white when hot. Zinc oxide, for instance, gets yellow when hot, and ceria may emit like a dark coloured body when hot. According to Féry, it has a much greater emissivity both for heat and light than thoria. The ceria of chemistry books is white, but the ceria of commerce is yellow.

Almost anything coloured, however, increases the light of thoria if added in very small quantities. The reason why ceria is used is not that it has any peculiar radiating qualities. It is chosen because it is fairly permanent at the high temperatures, and does not weaken or spoil the thoria mantle. The earlier mantles were of zirconia and yttria, in the proportion to make a normal zirconate. Zirconia alone gives very little light, and makes a bad mantle mechanically. The yttria would contain erbia if separated by potassium sulphate. When lanthana was used, it would probably contain didymia, and perhaps ceria.

The light of the mantle may thus be purely that due to a hot body at a given temperature; the proportion of components of different frequencies being simply that due to the temperature. The addition of a little more ceria would then increase the emissivity, and cause greater radiation and a fall in temperature, so that the light would decrease. A decrease of ceria would diminish the emissivity, so that though the mantle became hotter, it would radiate less of all wave lengths.

Though this simple explanation may be ample, it does not follow that there may not be all sorts of curious things—such as selective emission, luminescence, catalytic action, resonance, unstable oxidation, and other occurrences, whose names are as impressive as vague. They may be discussed in turn.

By selective radiation may be meant that a body at the temperature of a black body emits some rays and omits others, or that it has the power of emitting more refrangible rays than a black body at the same temperature. If two black bodies are in a reflecting envelope at the same temperature, each radiates to, and absorbs power from, the other. The heat in each is in a state of degradation corresponding to the temperature; and in a state of equilibrium it must be radiated and absorbed by each without further degradation. Heat radiated from a black body into a closed space in equilibrium is thus not degraded. If a body only emits the portion of the rays of high frequency, though it may radiate less power or energy per second, that energy would seem to be of a higher grade than that of the black body at the same temperature, so that it can be degraded into radiation of lower frequency. If that is so, this sort of selective radiation violates the second law. Emitting more refrangible rays than the black body is worse still. It does not follow from this that a body

cannot emit rays of high frequency balanced by another batch at low frequency, so that their degradation corresponds with the temperature. This form of selective emissivity has not yet been invented by the advocates of this theory.

There does not seem at present to be any thermodynamic reason why a hot body should not radiate a selection of rays, provided the energy radiated is not less degraded than the heat in the body, or, to put it the other way, as long as the energy has no increased "motivity," to use Lord Kelvin's term. For the radiant energy leaving the surface to have a higher motivity than the energy in the body is a violation of the second law. There is an interesting question as to whether the radiant energy leaving a hot surface can start with less motivity. I am not considering increase of entropy of radiation spreading out after it has left the surface, but whether there can be a sudden discontinuous degradation at the surface. Growth of entropy in the case of heat conduction, irreversible expansion, and diffusion, is a volume increase; and it takes place when the motion of the particles is not the same in all directions or is not diffused. Thus in heat conduction, the particles move more quickly when going one way than when going the other, though the distance is the same each way. In diffusion, the motion of the particles of the fluids is, on the whole, directional. Here the speed is the same, but the distance different. Similarly with radiation in space. It seems open to question whether there can be a sudden or discontinuous change of motivity as the energy crosses the surface, changing from sensible heat to radiation. Stokes's law, that a fluorescent body cannot give out radiation on the whole of a higher refrangibility than the radiation that induced it, does not appear to have been proved, but seems to have been rather a sort of automatic statement, unconciously based on knowledge, sounding as if it must be right.

It may be said that an ordinary spirit or bunsen flame does not give any light to speak of, though it is hot enough to incandesce a mantle, and it certainly radiates a great deal of heat; and though it is not a surface, if its radiation has less motivity than the hot gases, there must be discontinuous increase of entropy there. Perhaps. But, on the other hand, it may make up for its low frequency radiation by some very high; and the blueness of the flame is significant. Again, in a flame it may be the slower-moving particles that combine.

Another theory, very much to the fore in connection with electric lamps, is that different surfaces have different radiating efficiences. The experimental evidence on this point is very conflicting, and the conclusions are often, I submit, unsoundly drawn. There is direct evidence, due to Féry, that the emissive light-efficiency—candles per watt—varies enormously. At 1400°, for example, taking the efficiency of a perfectly black body as 1, lanthana is 17, thoria 9, a thoria-ceria mantle 7, platinum 5, chromium oxide 4, carborundum 3, carbon 1·3. On the other hand, chromium oxide and ceria in the reducing flame radiated more total heat per second than a black body—an absurdity which the author himself was the first to criticize. There is apparently a clear instance of selective or preferential emission in the case of erbia. In the flame it shows bright bands in the green. I have not tried a Nernst rod of it.

The next theory is that the mantle gives more light than that due to a simple hot body, owing to luminescence. I cannot deal with this theory, because I have no clear idea what luminescence is. If by luminescence is meant the phenomena of a mantle, it is no explanation of the phenomena to call them luminescence.

Catalytic action is also a little vague. The idea often seems to be that, by some action or other, the ceria can convert energy of chemical action directly into light. It must be remembered that chemical energy is not work; it is partially degraded, and may be best regarded as heat, of which only a portion $(\theta-\theta^1)/\theta$ can be converted into work. No catalytic action can restore chemical energy to a higher grade. But many of the chemists who advance the catalytic action theory are not men who would make slips of that sort.

The catalytic argument may perhaps be put something like this: If a mixture of gas and air is above ignition temperature, and is enclosed in a case from which no heat can escape, the speed of the chemical action will depend on the temperature, the pressure, and the relative amount of air, fuel, and combined products. We will take the pressure as constant. The rate of combination then depends on the combustion already completed. Suppose now the combustion takes place in a flame. Let us consider a small volume of burning mixture ascending. It can now radiate heat, and the temperature corresponding to a given proportion of fuel burned is lowered. If the reaction constant could be artificially increased, the flame would be hotter and would radiate more heat. The rate of radiation of heat keeps the flame temperature from rising to such a value that the reaction constant is zero, or that the products dissociate as fast as the fuel burns. If ceria has the power, by catalytic action, of increasing the reaction constant, the ceria may be considerably hotter than the flame; and catalytic action may thus cause the mantle to give out rays corresponding to a higher temperature than the flame, though not to a higher temperature than that corresponding to the chemical action. There must always be some degradation of energy.

It is said that ceria acts in a special way by wobbling from one state of oxidation to another. It is quite clear that an oxide cannot create energy or heat or light by wobbling; moreover, it cannot be in equilibrium in both states. If it is in equilibrium in one state, it cannot move out into a higher state. Again, chemists who put forward the oxidation theory are not likely to put it in such a form as this. Thus a more tenable proposition is to be sought. If the rate of combination depends on the collisions of suitable particles at suitable speeds, and if the lower oxide of cerium can hang on loosely to oxygen particles so that it has a stock of them, any fuel particle, hitting the ceria at suitable speed, can combine with oxygen. The ceria would thus heat the mantle above the temperature of the flame, or at any rate to a higher temperature than it would otherwise reach.

The next theory is that of "resonance." Particles of gas are vibrating and changing their velocity fast enough to produce light, but somehow do not produce it. Particles of solid, however, get set into vibration synchronously with the gas particles, and thus radiate energy of the same grade as the heat of the flame. But ceria is supposed to be specially timed to vibrate with frequencies corresponding to visible radiation; so it radiates more light than other solids. This really amounts to ceria doing the work of Maxwell's demon, except that it is working on waves instead of particles. It can get outside the second law just the same. Maxwell's demon is apt to come into radiation in many disguises. He is rather fond of being a very thin plate which lets only one wave length through, and reflects all others perfectly. I have seen him mixed up in proof of Wien's law in this disguise.

The explanation that there is nothing anomalous about the mantle, and that it gives light just because it is very hot, has a "Jordan" simplicity about it which makes it unpopular compared with the "Abana and Pharpar" of luminescence and catalytic action. All the same, very simple explanations are often wrong.

PERSONAL.

At the examinations recently held at the Norwich Technical Institute for membership of the Royal Sanitary Institute, Mr. W. H. Archer, the Manager of the Cromer Gas-Works, was admitted, having passed in the subject of sanitary science.

Mr. Thomas Watson, of Midleton, Co. Cork, has been appointed Manager of the Girvan Gas Company, Ayrshire, in place of Mr. J. Lindsay, resigned. Mr. Watson is a native of Kilmarnock, and was for twelve years in the Kilmarnock Gas-Works, under Mr. W. Fairweather. He has been Manager at Midleton for rather more than three years.

At the Nottingham Gas-Works last Saturday, Mr. J. Carter Moon was presented with a solid silver rose-bowl, bearing an appropriate inscription, by the workmen and staff, on his leaving to take the position of Gas Engineer and Manager of the Middleton Corporation. Mr. Whatton made the presentation; and Mr. Worthey (the foreman) offered a few remarks on behalf of the men. Mr. Moon suitably acknowledged the gift. All the workmen and officials were present.

At the last meeting of the Directors of the Shanklin Gas Company, Limited, they presented Mr. Frank C. Taylor, the Engineer and Secretary, with a valuable gold watch and chain, the former bearing the following inscription: "Presented to Mr. Frank C. Taylor, Engineer and Secretary, by the Board of Directors of the Shanklin Gas Company, Limited, as a mark of esteem and appreciation, and for valuable services rendered to the Company for 25 years—1881 to 1906." We are glad to know that this appreciation of long and faithful service has not been confined to the Board-room; for Mr. Taylor has received many congratulations and some presents from shareholders in recognition of the completion of a quarter-of-a-century's connection with the Company.

An interesting event took place in the Masons' Arms Hotel, Middleton, on Saturday evening, the 4th inst., when Mr. E. E. J. Anderson, the late Engineer and Manager of the Middleton Gas-Works, was presented with a handsome marble clock by the officials and workmen. The presentation was made by Mr. J. Jessop, one of the oldest of the employees, who expressed the great regret felt by all at parting with their former chief, and said he and his colleagues hoped Mr. Anderson would have good health to enable him to carry out to the best advantage the new work he has undertaken. Mr. Anderson, in replying, said he was sorry to sever his connection with his fellow-officers and workmen, and would always remember the days he had spent at Middleton. He trusted the beautiful present which they had so kindly made to him would be handed down to his children; so that they also would remember the time they had spent in the town. After the presentation, Mr. Anderson took the opportunity of introducing Mr. J. C. Moon, his successor, who said he was pleased to be among the employees, and hoped he would be able to work as well with them in the future as Mr. Anderson had done in the past. The rest of the evening was spent in a smoking concert.

Our contemporary "Engineering" has sustained a great loss by the sudden death, on Wednesday last, at the age of 66, of Mr. James Dredge, who had for many years been joint Editor with Mr. W. H. Maw of that publication. Mr. Dredge was born in Bath, and came to London in 1858. He was a member of the Institution of Civil Engineers, of the Institution of Mechanical Engineers, and some other engineering societies.

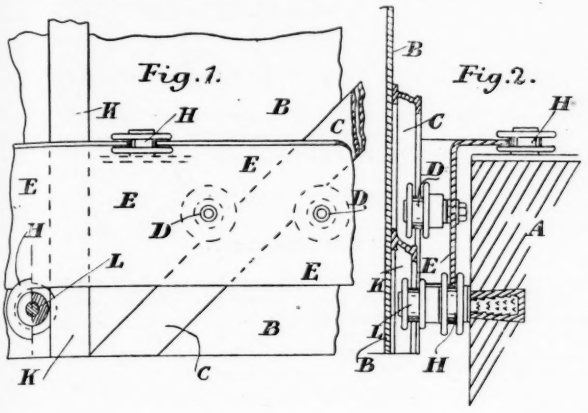
REGISTER OF PATENTS.

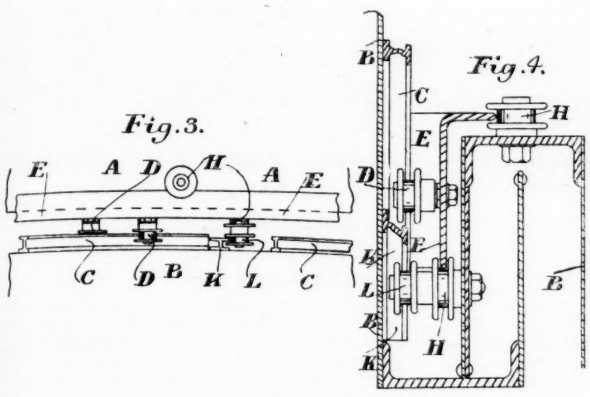
Columnless Gasholders with Spiral Guides.

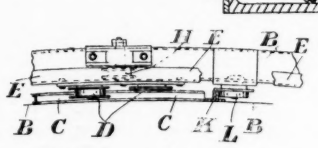
GADD, W., of Manchester.

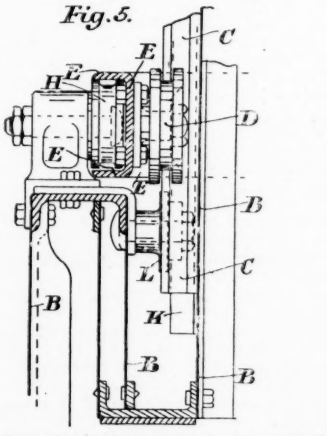
No. 24,899; December 1, 1905.

In the "JOURNAL" for Feb. 6 last (p. 344), the patentee communicated some particulars of this invention, which is a development of that known as the Gadd and Mason patent of 1887; and for the present arrangement he claims: "In gasholders supported by spiral guides, the combination therewith of vertical guides and a moveable ring, or equivalents arranged around the circle, together with the necessary guide and grip rollers connected therewith, for the purpose of giving a vertical rise and fall to this class of gasholders."









Gadd's Vertically-Rising Spiral-Guided Gasholder.

The spiral guides may either be fixed to the sides of the tank or on to the vertical surface of the gasholder bell, as may be preferred (in manner similar to that which has heretofore been arranged); but, in addition thereto, vertical guides are employed—as many as may be found requisite—to prevent the turning movement due to the friction of the spiral guides.

The guide-rollers or rubbing pieces, into which the spiral guides take, instead of being arranged as fixtures or resisting points upon the tank wall or bottom curb of the holder, are attached to a ring or band, of suitable form, capable of moving horizontally around the circle, so that, as the holder rises and falls vertically, the spiral guides give a horizontal circular motion to the ring, instead of a spiral motion to the holder itself. Nevertheless, the ring, travelling horizontally, in suitable bearings or supports, firmly and securely grips the holder at all heights, and yet enables it to rise and fall vertically—"thus obviating any inconvenience which, in some cases, may possibly ensue from the screw-like or spiral rise and fall at present characteristic of this class of gasholder."

Variations in detail are possible, such as in the sectional forms of the spiral and vertical guide-rails, the number of them, and their mode of attachment, whether to the holder or tank sides, also to the formation of the travelling ring, which may either be a rigid ring, or made up of sections connected together, or acting in concert. The mode of mounting them on or in connection with the necessary supports may also vary, as also the mode and direction of fixing the supports (which latter may be either anti-friction rollers or rubbing surfaces, as the particular case may demand). The improvements may further be applied to telescopic gasholders, in an analogous manner, without departing from the invention.

The illustrations refer to gasholders which have the spiral guide-rails mounted on the exterior surface of the holder; but, as already stated, the reverse arrangements—of rails mounted on the tank side, or on the inside of the lower lifts—can be employed. Fig. 1 is an elevation (part in section) of a portion of a gasholder arranged in accordance with one form of the invention—the tank side being omitted for the sake of clearness. Fig. 2 is a sectional elevation of portions of the holders and tank walls. Fig. 3 is a part plan view of the holders and tanks on a smaller scale. Fig. 4 is a sectional elevation showing adaptations of the invention to the inner and outer lifts of telescopic gasholders. Fig. 5 shows a modification in detail construction.

A represents the wall of the gasholder tank, and B the gasholder bell. C are spirally formed guide-rails, mounted upon the external surface of the holder. D are the rollers for engaging with the rails, and which rollers have heretofore been arranged as resistance points, but, in accordance with the present invention, are attached to a ring or band E, capable of moving horizontally around the circle. Anti-friction rollers H are mounted upon the tank or lower lift when the arrangement is in accordance with that shown, and upon the gasholder in the alternative device. These rollers support the ring or band E, and allow it to freely move in a circular path when necessary.

In Fig. 5, the rollers H project within the ring E, which is of channel section; but in the other figures, a band E, of inverted L or other section, rides within flanged rollers H.

The rollers D, engaging with the spiral rails C, thus enable the holder to be securely gripped or held at all heights of its rise and fall.

K are vertical guides, as many as may be found requisite, mounted in like manner to the spiral guides—that is to say, upon the holder or the tank side as the case may be. The vertical guides take into guide-rollers, such as L, mounted in opposition, for the purpose of preventing the turning movement of the holder due to the friction of the spiral rails, and to cause the holder to take a vertical rise and fall.

In operation, it will be seen that, as the holder rises or falls, it is prevented from turning by the vertical guides K, engaging with the rollers L; but the inclination of the spiral guides C, taking into the rollers D, will (while the holder is in motion) impart a circular movement to the band or ring E, by which means the holder will be firmly held at all working heights. Any tilting of the holder is prevented by reason of the ring E enabling all lateral pressures to be resisted at the gripping points around the circle.

Water-Gas Apparatus.

TULLY, C. B., of Cross Street, Finsbury, E.C.

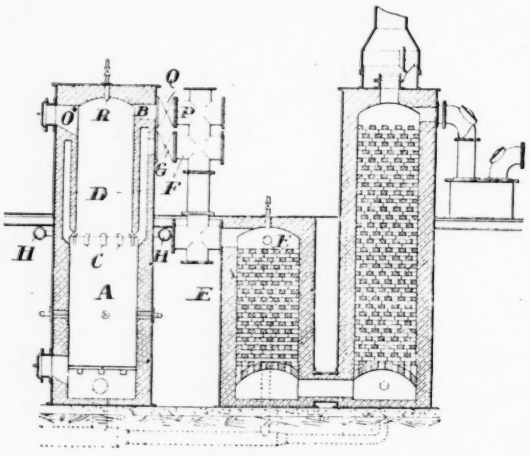
No. 15,194; July 24, 1905.

The patentee's proposal is to manufacture water gas suitable for heating and illuminating purposes in such a way as to admit of a large quantity of tar or other comparatively cheap heavy hydrocarbon, and less oil and coke or other solid fuel being used than usual; and also "to enable a cleaner and better gas to be discharged from the carburetting and superheating portion of the plant than usual, so as to throw less work on the purifying apparatus and permit the same to continue working for longer periods of time, without cleaning, than is ordinarily the case."

During the preliminary or blowing-up stage of the process, air is caused to pass through only the lower portion of the mass of solid fuel in the generator—say, for example, through about one-half the fuel. This is thereby raised to incandescence, and the resulting gas is mixed with air and burnt in proximity to, but out of contact with, the upper portion of the mass of fuel, by burning it in a jacket surrounding the upper portion of the fuel, so as to heat it to a high temperature without causing its combustion. Tar or other heavy hydrocarbon is simultaneously injected on to or into (or both) the upper portion of the fuel thus heated, so as to be decomposed thereby. The solid products of the decomposition are deposited in the fuel, and the gaseous or vaporous portion is caused to mix with the combustible gas flowing off from the lower incandescent portion of the fuel and become partly burnt therewith. The highly-heated products of incomplete combustion are then led into the carburetting and superheating portion of the plant, wherein the combustion is completed by the addition of more air; and this portion of the plant is raised to a very high temperature. The products of complete combustion finally escape into the external atmosphere, as before, past a snift-valve.

After this preliminary or blowing-up stage has continued for a sufficient time to raise the lower portion of the fuel to the required degree of incandescence, and the carburetting and superheating portion of the plant to a suitably high temperature, the supply of air to the gas generating, carburetting, and superheating portions of the plant is cut off, the snift-valve closed, and the exit of gas from between the lower and upper portions of fuel in the gas-generator prevented. Steam and tar are then injected into the lower incandescent part of the fuel, and

oil is sprayed into the top of the carburetting portion of the plant; tar being simultaneously injected on to or into the upper heated portion of the mass of fuel through which the gaseous products resulting from the decomposition of the steam and tar by the incandescent portion of the fuel simultaneously flows in an upward direction, and in which solid products of the decomposition are arrested. The gaseous products of decomposition, together with the gaseous products of decomposition of the injected tar into the upper heated portion of the fuel, pass on together into the carburetting portion of the plant, where it becomes mixed with the products resulting from the decomposition of the oil simultaneously entering that portion of the plant. The gaseous mixture then flows through the highly-heated carburetting and superheating portion of the plant, wherein it is fixed, and the resulting gas is led away to the usual plant. The injection of the steam and tar may be continued for from six to eight minutes, according to the heat of the generator; but the tar, in practice, is shut off about one minute or so before the steam, to allow the plant to become clear of it.



Tully's Water-Gas Plant.

The upper part of the generator A is constructed (as usual) with a surrounding annular combustion chamber or jacket D, in communication at the lower end with the interior of the generator through a series of openings C, arranged between the top and bottom. At the top it is adapted to be placed in communication with the top of a carburetting chamber E by a connecting pipe F provided with a valve G. To the jacket D is connected an air-supply pipe H, with a valve for admitting the necessary air for burning part of the gases entering the jacket from the generator; the temperature at which the apparatus is worked being such (say about 2000° Fahr.) as to cause automatic ignition of the gas when the air supply is turned on. The upper end of the generator is, in addition to the normally closed solid-fuel inlet O, provided with a gas-outlet B—also adapted to be placed in direct communication with the top of the carburetting chamber through a pipe P with a valve Q, and with steam-nozzles R, for injecting tar on to the top of the fuel in the upper portion of the generator.

During the blowing-up stage the valve G is open, and the valve Q closed; so that the combustible gases produced when raising the lower portion of the fuel in the gas-generator to incandescence will pass through the openings C into the jacket D, and thence to the carburetting chamber E. Air is simultaneously admitted to the jacket D by the pipe H, so as to burn some of the gases in the jacket and raise the fuel in the upper part of the generator to a high temperature; and tar is simultaneously injected through the nozzles R on to the top of the heated fuel. The solid products of the decomposition of the tar are deposited in the fuel; while the gaseous products pass downward through the fuel, and flow, with the ascending gases from the lower portion of the fuel, through the openings C into the jacket D. During the production of carburetted water gas by injecting steam and tar into the incandescent fuel in the lower part of the generator, the valve G is closed, the supply of air to the jacket D is cut off, the valve Q is open, and tar is injected on to the top of the heated mass of fuel in the upper part of the gas-generator through which the gaseous products resulting from the decomposition of the steam and tar injected into the lower incandescent mass of fuel flow in an upward direction, and in which the solid products of such decomposition are arrested, while the gaseous products from the tar become mixed with the first-mentioned gaseous products in the upper part of the generator. The mixture thence flows off through the outlet B, pipe P, and valve Q direct to the carburetting chamber E. In this way, the products of decomposition of the tar admitted to the top of the generator are prevented from being injured by excessive heating, and "are made available for carburetting or enrichening the water gas to such an extent that little or no oil will need to be injected into the carburetting chamber E."

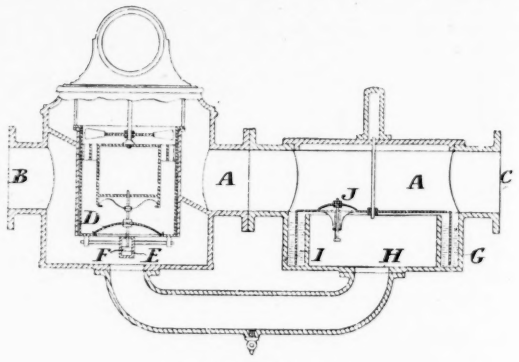
Anti-Pulsators.

THORP, T., of Whitefield, Lancs.

No. 21,765; Oct. 26, 1905.

This is an apparatus for obtaining a uniform rate of flow of fluids in pipes and closed conduits in cases where the pressure is subject to sudden variations—as, for instance, where gas-engines are supplied or exhausters used, or where the production of a gas is intermittent—and particularly to such apparatus used in conjunction with fluid meters. The uniform rate of flow is obtained, first, by interposing a valve in the current (and which opens to the flow and is controlled so as to prevent any sudden movement thereof), and beyond this valve there is a device which acts as a kind of equilibrium reservoir for the excess volume endeavouring to pass through the valve.

The meter is shown as interposed in a conduit A; so that all the current normally passes through it. B is the inlet and C the outlet. The valve D normally closes the entrance to the meter; and if no meter were interposed, it would normally stop up the passage through the conduit. The valve opens to the flow, and is so weighted that, when upon its seat, it requires a certain pressure to open it. It is shown weighted by a spring, as described in patent No. 5791 of 1905, by which, as the valve rises, the pressure thereon of the spring decreases, so that the amount of pressure absorbed by the valve and passage through the conduit remains constant for various rates of flow. The valve is provided with a dash-pot arrangement for the purpose of preventing too sudden an opening or closing. This arrangement consists of a cup E fixed to the casing centrally beneath the valve, and a plunger F fixed to the valve spindle. A small duct (not shown) permits the fluid beneath the plunger to pass to the top in the usual way.



Thorp's Anti-Pulsator.

The conduit A in enlarged to form a cylindrical chamber G, which has an opening, in the bottom, and a deep channel I round the opening. The channel is nearly filled with mercury, and a bell dipping into it is weighted to produce the same pressure as the meter requires to work it. An opening is formed in the meter casing beneath the valve D, and a branch pipe leads from this opening to the opening H. A relief or safety valve J is preferably placed in the bell, which has its lift constricted so that the valve opens into the conduit A and is loaded, so that it will open before the mercury seal becomes broken by any abnormal pressure.

Hydraulic Mains.

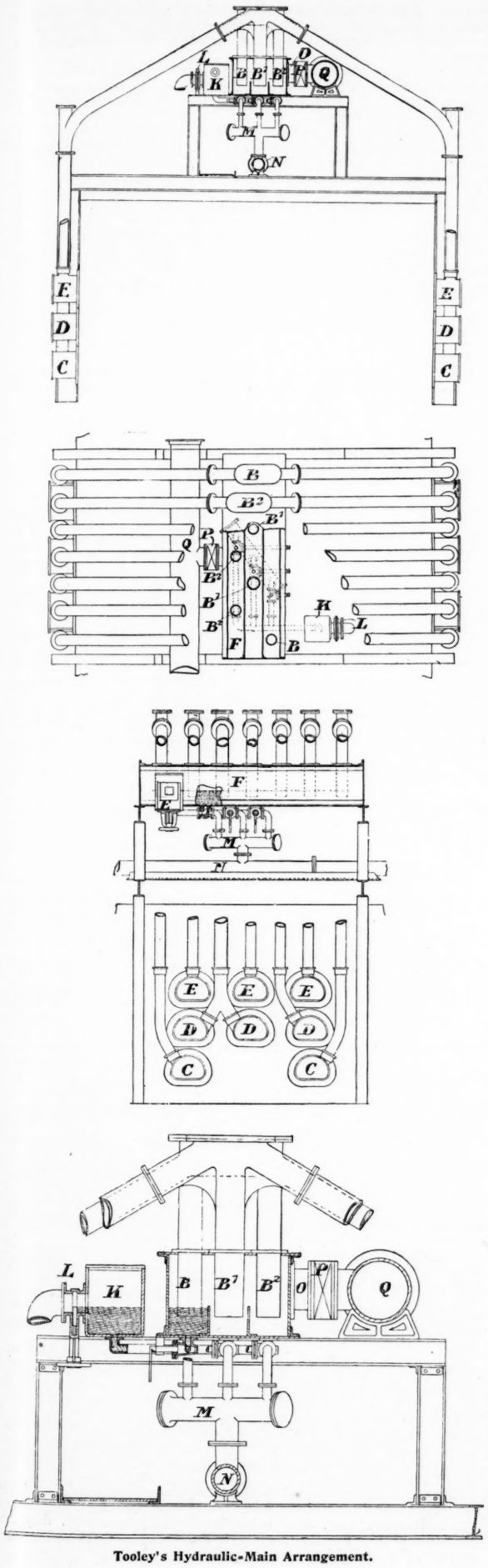
TOOLEY, W. G., of Leeds.

No. 25,783; Dec. 11, 1905.

Regarding his invention "for improvements in or connected with hydraulic mains for gas-retorts" and relating to "the sealing and unsealing of dip-pipes of hydraulic mains," the patentee remarks: As is known, in some cases the dip-pipes are unsealed when the gas is passing from the retorts and through the hydraulic mains, and are sealed when the retort-lids are opened for the purpose of permitting the withdrawal of the coke and the charging of the retort with coal, and preventing the gas returning to the retorts from the hydraulic or foul-gas main. In common practice the dip-pipes are constantly sealed throughout the entire length of the retort-house; and therefore the resistance to be overcome by the pressure of the gas when passing through the water throws the pressure on the retorts—especially when the dips are unevenly sealed. He proposes therefore to ensure that the sealing will take place before the retort-lid is opened and after the lid is closed; while the dip-pipes are afterwards unsealed, and continue so while the gas passes from the retorts and into the mains beyond. The result of his arrangement of working, without passing through the seal of the dip-pipe, is said to enable better and more even results to be obtained as regards the evenness of flow and the production of a larger yield of gas from the coal, as the resistance to the free passage of gas when passing from the coal will be reduced, especially during the first part of the time during distillation, and, in addition, the pressure of the retorts will be relieved, and consequently the tendency for the formation of carbon and leakage in the retorts. The invention will further have the advantage of minimizing the choking of the ascension pipes; and also the choking of the hydraulic mains by tar will be prevented by regularly drawing off the liquor and tar every time the retorts are opened.

The illustrations (p. 527) are cross section, front elevation, and plan of a retort-bench, showing the general arrangement of the ascension and cross pipes through which the gas passes from the retorts to the hydraulic main, the outlet for the gas from the hydraulic main, and the arrangement of valves connected to pipes for emptying and filling the sections of the hydraulic main. There is also an enlarged section of the hydraulic main, with the arrangement of valves and pipe for emptying and filling it.

The ascension pipes are so arranged that those from the bottom retorts C lead to the dip-pipes B, the pipes from the middle retort D lead to the dip-pipes B^1, and the pipes from the top retorts E lead to the dip-pipes B^2. F is the hydraulic main, the bottom of which is constructed with plates which divide the main into three sections—one receiving the dip-pipes B, one for the pipes B^1, and one for the pipes B^2. The sections of the hydraulic are provided with outlet-pipes fitted with three-way cocks or valves, and inlet-pipes leading to valves or cocks for supplying water or ammoniacal liquor from the liquor-supply tank K, which is provided with a regulating seal or overflow



Tooley's Hydraulic-Main Arrangement.

weir valve L, and may be common for serving any number of hydraulic mains on the retort-stack.

The outlet-pipes are connected to a cross pipe M, leading into a main N, for conducting the ammoniacal liquor from the main as it is formed, and also for emptying sections of the hydraulic main after the retorts have been charged and the retort-lids closed.

O is the gas-outlet from the hydraulic, provided with a valve P and connected to the foul-gas main Q.

Prior to opening the lids of the retorts for discharging the coke and charging with coal, the three-way cock is closed to the outlet pipe and opened to the liquor-supply pipe, and the section of the hydraulic main containing the pipes B filled until the dip-pipes are sealed. The retorts may then be opened without risk of the gas from the unsealed section or foul-gas main returning down the ascension pipes. After the retorts have been charged and the lids closed, the cock is closed to the supply-pipe and opened to the outlet-pipe. This section of the hydraulic main is then emptied, and the dip-pipes become unsealed, and the gas passes away through the outlet O into the gas-main Q.

The same operation is carried out when the lines of retorts D or E are opened, except that the corresponding valves are operated for the purpose of filling or emptying the sections containing the dip-pipes B^1 and B^2 of the hydraulic main.

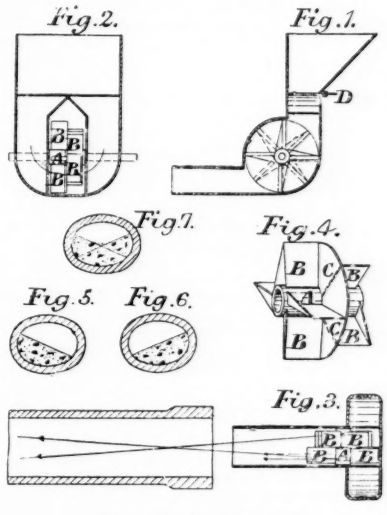
Retort-Charging Machines.

EITLE, C., of Stuttgart, Germany.

No. 4367; Feb. 22, 1906. Date claimed under International Convention, Oct. 4, 1905.

This invention relates to machines for charging gas-retorts and the like by means of propellers supplied with coal from both sides, so as to effect a uniform charging. In the hitherto known charging-machines for the same purpose, the patentee remarks, the coals entering into the propeller casing from both sides meet in the middle, whereby their advance is arrested, and they drop down in the middle of the casing. Thus when they are further propelled to the retort by the rotating blades, each blade was loaded more in the centre than at the sides, which results in more material being heaped up along the middle of the retort than at its sides, in consequence of which the coal is not utilized completely.

The essential feature of the invention consists in so deflecting the two streams of coal from the direction in which they are supplied—by any kind of propelling apparatus—that the coals are thrown against the wall of the retort, which is opposite to their place of entry into the casing. The coals then are heaped up along the side walls correspondingly to their angle of repose, and meet together at the middle in such a manner that the layer of coal conforms to the curvature of the retort bottom, and has a uniform depth.



Eitle's Retort-Charger.

This result is obtained by providing two rotating propellers side by side separated by a partition wall and with blades set-over relatively to each other, at which the material arrives with a velocity so regulated that the resultant of the velocity of the blades, and that of the entering streams of coal, is directed towards the opposite wall of the retort, while a simultaneous crossing of the coals is avoided by the set-over of the blades.

Fig. 1 shows the propeller casing and blades in longitudinal section. Fig. 2 is a longitudinal section of fig. 1. Fig. 3, in horizontal section, shows the retort and the direction of the velocity of the feed and of the blades at the moment of throwing, and the direction of the throw resulting therefrom. Fig. 4 shows the blades themselves in a perspective view. Fig. 5 shows the charge of the retorts by the right half blades; fig. 6 that by the left half blades; and fig. 7 the total charge resulting therefrom.

The material flows from the lateral feeding shoots into the propeller casing parallel to the shaft, and is seized by the blades while still in motion. Thereby a velocity corresponding to the length of throw is imparted to it, in a direction vertical to the shaft. In consequence of this, it is flung (in the resultant direction of the two directions of velocity acting on it) against the opposite side wall of the retort, and there accumulates, with its natural angle of repose, as shown by figs. 5 and 6.

The quantity and speed of the coal entering the propeller casing can be varied by adjusting the slide D, or by making the side wings of the blades larger or smaller, or by varying the number of the blades, as described in patents No. 16,231 of 1904 and No. 10,065 of 1905.

In order to avoid the simultaneous crossing of the coals, the propeller boss A is fitted with two sets of half blades B, which are separated by a wall C and set-over against each other by half the pitch of the blades. With the feeding of the material from both sides, the action explained above takes place for each half blade, but a mutual interference of the coals thrown in two directions crossing each other cannot occur, as the quantities of material seized by the several half blades are thrown consecutively as regards time. By this alternating throwing to the right and left by the blades, the material is deposited equally against the two side walls; the coal falling back a little from the side walls towards the middle, so that the charge of the retort conforms to the sides and the bottom with an equal section.

Prepayment Gas-Meters.

LORAM, E. R., of Raynes Park, Surrey.

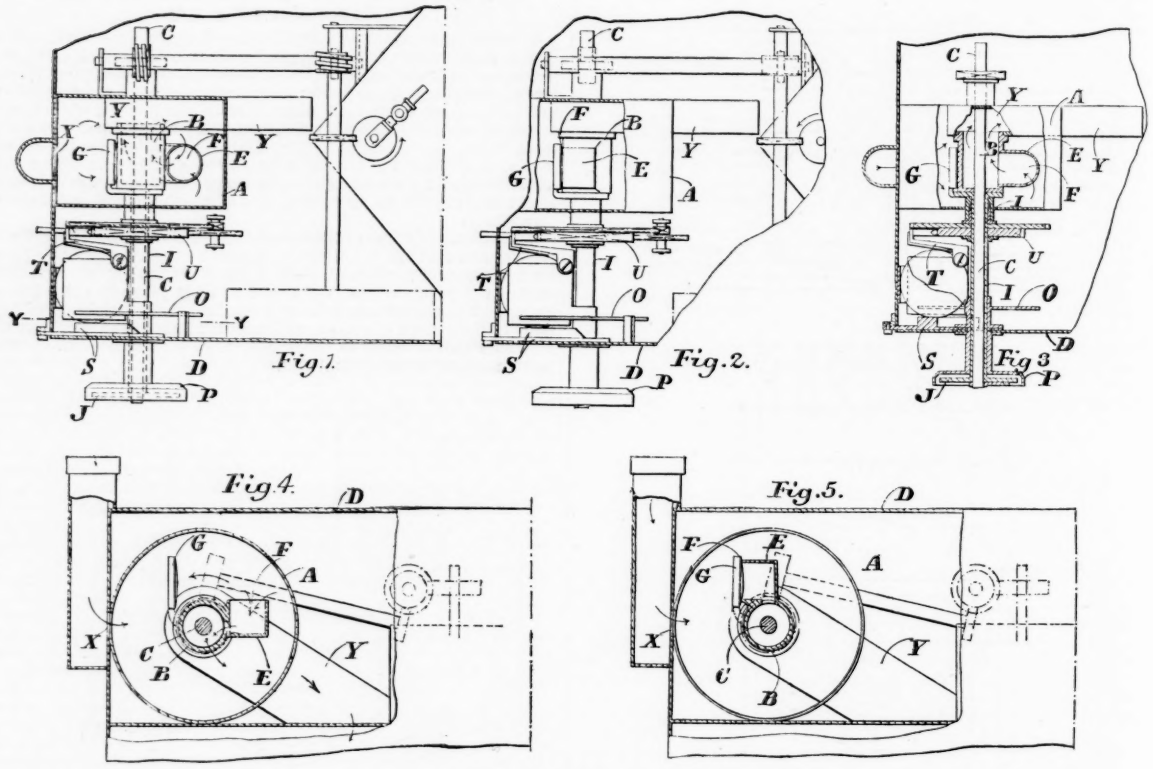
No. 510; Jan. 8, 1906.

In this prepayment gas-meter, a rotary valve is employed, the seating of which is fast on a spindle on which the valve is mounted so loosely that, on the insertion of a coin, the closure device may be moved away from its seating a distance according to the predetermined quantity of gas to be consumed for each coin. The body (seating) during the consumption of the gas approaches the valve till closure is effected through the medium of gear driven from the index-shaft of the meter.

Fig. 1 is a sectional plan of the appliance with the valve open; fig. 2, a similar view with the valve closed; fig. 3, a sectional plan view through the operating spindles. Figs. 4 and 5 are vertical sections of the valve open and closed.

Within the casing A is a valve body (seating) B, fast on the shaft C, which extends through the casing D. The body B is hollow and is provided with an extension E open at the top and communicating, through the valve seat F, with the interior of the valve body. The opening is closed by the valve G carried by an arm of the hollow spindle I, which likewise extends through the meter casing and carries at its outer end the unconsumed gas index plate J. The spindle C carries the index finger. To effect the opening of the valve, a coin is inserted through a slot into the jaws of a carrier plate O mounted freely on the shaft I. The handle P is then rotated till it strikes and rides up an incline of the snail plate S, and in so doing forces the arm T toward the wheel U (loose on the spindle I), so as to lock the click carried by the arm in the teeth of the wheel, and so carry round the wheel and its spindle and arm and the valve G, and uncover the opening admitting gas from the inlet pipe and opening X to the chamber A.

The gas then enters the body B, and passes to the ordinary bellows or drum by the passage Y. The coin at the end of the movement of



Loram's Prepayment Gas-Meter.

the carrier-plate slides through an opening in a guide down to the money box (not shown). To assist in turning the spindle I, the wheel U engages with gear which carries a pinion engaging with a wheel fast on the spindle I—a pawl being provided to prevent any backward movement of the wheel, except when lifted by hand to return the mechanism to zero.

The closing of the valve is effected through the medium of a worm (operated in the usual manner by the bellows arms) and worm wheel on the usual index-shaft of the meter. Gearing fast on the spindle C causes the valve body B to move toward the valve (closure) G till it is closed. These movements take place each time a coin is inserted; but by putting in two or more coins, the distance between the valve G and the seating E can be increased, inasmuch as the valve is mounted loose on the spindle of the body B.

To vary the amount of gas for each coin, the snail-plate S is adapted to be revolved in either direction upon the boss of the handle P, so as to vary the position of the striking point of the snail—*i.e.*, giving longer or shorter travel to the coin carrier before the coin can come into operation; any suitable means (such as a screw) being provided to engage with slots or the like in the snail-plate, so as to secure it in position.

Incandescent Gas-Mantles.

LAYCOCK, T. P., of Peterborough.

No. 11,572; May 17, 1906.

This invention consists in coating or impregnating mantles with a film or deposit of a platinum salt, with a view both of increasing the light-giving power of the mantles, and of mechanically strengthening them, so that they may be less liable to fracture.

The platinum salt may be applied to the mantle by momentarily dipping it into a bath of an alcoholic solution of the salt of the metal, or by spraying the mantle with the solution. The latter is preferable. The mantles while being dipped should be suspended by their upper ends; and while being sprayed they should be mounted in an inclined position on a support adapted to hold the mantle in place during the operation.

The salt of platinum to be employed is the bichloride of the metal, the proportions found to give the best results in practice being one-eighth part of the bichloride to sixteen parts of alcohol by weight. An appreciably larger proportion of the platinum salt causes the mantles to emit a reddish light; while an appreciably less proportion yields no satisfactory result, and would, in fact, be likely to produce deterioration in quality.

The solution is prepared by introducing the platinum salt and the alcohol into a glass-stoppered air-tight vessel, and allowing the mixture to remain therein for about 48 hours, during which time it should be frequently shaken until the solution becomes perfectly clear and bright. Care should be taken to remove any gummy matter contained in the alcohol before preparing the solution, as its presence has the effect of so thickening the solution as to prevent it penetrating into, and thoroughly impregnating, the fabric of the mantle with sufficient certainty and rapidity.

The mantles are subjected to the above treatment after they have undergone all the usual processes of manufacture—including that of "collodionizing," and, after being impregnated or coated, they are allowed to dry for about 20 minutes in the atmosphere at a temperature of from 70° to 80° Fahr.

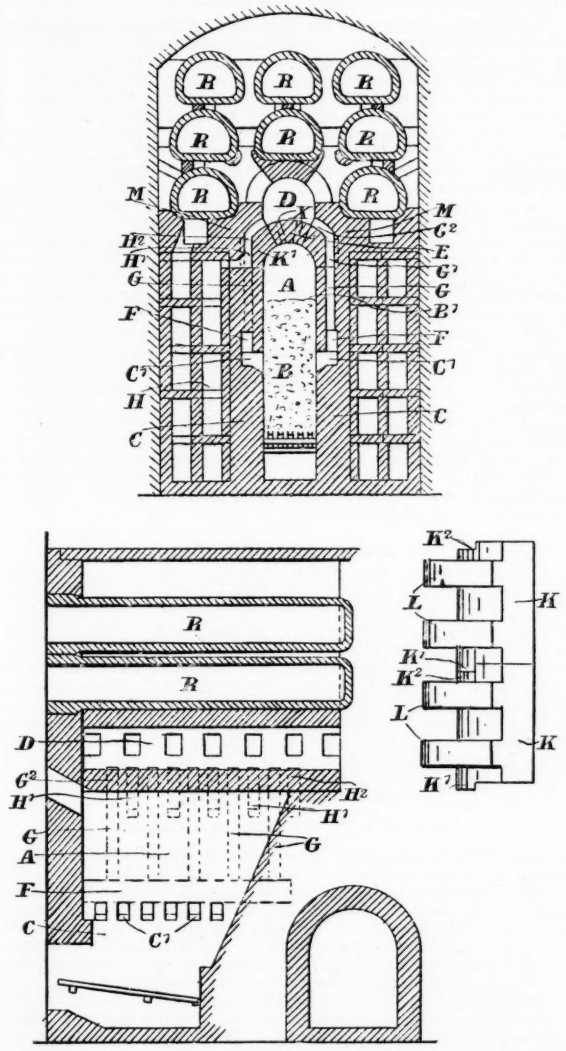
Regenerative Gas-Retort Furnaces.

HUDSON, E. H., of Normanton, and SUGDEN, F. C., of Leeds.

No. 6985; March 23, 1906.

In this arrangement, the equal distribution of producer gas and secondary air over the whole length of the combustion chamber is secured, "with the advantage that uniformity of temperature of the secondary air and producer gas is obtained at the point or points of their contact—thus ensuring uniform heat over the whole length of the retort-bed." The invention, broadly, consists in an arrangement of conduits or ducts made of tiles, blocks, or bricks, whereby the producer gases are taken from the sides of the producer, instead of from the top as is usually the case, up the side walls of the producer, and through special grooved or moulded blocks or brick ducts, which convey the producer gases and secondary air, in alternate ducts or grooves, into the combustion chamber.

More particularly, the furnace or producer, which contains suitable fuel B, is provided in the side walls C with ducts or passages C^1, preferably arranged below the top surface of the fuel; there being no ducts X (shown by dotted lines) into the combustion chamber D,



Hudson and Sugden's Regenerative Furnace.

through the arch E, as is usually the case. The ducts or passages C^1, which are formed of bricks, tiles, or blocks, lead into a longitudinal chamber F, from which extend vertical ducts G. The secondary-air passages H are arranged in the ordinary manner, as are the retorts R and combustion chamber D.

The air-passages H and vertical ducts G, at their point of exit, H^1 and G^1 (before passing to the combustion chamber D), are arranged alternately, and are continued forward to the combustion chamber in alternate ducts, grooves, or passages H^2 and G^2, formed, by preference, of special moulded or grooved blocks K. Each block is formed with a projection K^1 on one end and a recess K^2 on the other, in order to make a gas-tight joint, and thus form a portion of the furnace arch. The projecting portions L form walls for the ducts, and extend into, or up to, the setting M.

The secondary air and producer gas pass side by side in alternate ducts through the blocks K, causing the secondary air and the producer gas to enter the combustion chamber D at practically the same temperature, and ensuring thorough combustion, and therefore uniform heat, over the whole length of the oven.

MISCELLANEOUS NEWS.

MOTOR-CAR TRAFFIC AND GAS-PIPES.

Evidence of Mr. G. F. L. Foulger before the Royal Commission on Motor-Cars.

Our readers are aware that, during the sittings of the Royal Commission on Motor-Cars, evidence was given by Mr. G. F. L. Foulger, the Distributing Engineer of the Gaslight and Coke Company, on the effect of this kind of traffic on gas-mains. The evidence taken by the Commission has now been published, and we extract some particulars from that furnished by Mr. Foulger.

After a few preliminary questions by the Chairman (Viscount Selby), witness stated that the Company have 2184 miles of cast-iron mains, varying in size from 48 inches internal diameter downwards, and about 2000 miles of wrought-iron service-pipes, laid at an average depth of 2 feet. They were under all kinds of thoroughfares, and some were put down many years ago—the Company having been established nearly a hundred years. There had been no actual experience as to how long cast iron would last in the ground; but his own opinion was that in suitable soil the metal was practically indestructible. There were considerable objections to the laying of mains at a greater depth than 2 feet, as there would be more soil to excavate, more interference with the roads, and greater expense incurred. They found the pipes bedded themselves more solidly as time went on; and supposing they were not unduly affected by traffic, this would decidedly tend to reduce the liability to gas escapes. The Chairman pointed out that wood, asphalte, and concrete had of late years been introduced as materials for making roads; and he asked whether this practice had resulted in increasing the difficulties in solid roads. Witness replied that it had not. He said that, as a matter of fact, they felt very much alarmed, principally on the question of cost, when these expensive systems of paved ways came in; but their experience had been that by forming a sort of arch, which concrete did, taking its thrust against the kerb on either side of it, it tended to relieve the mains of the weight which otherwise would have been put upon them in an ordinary ballast road. This had to a large extent compensated for the extra expense the Company had been put to, because it minimized the number of times they had to get access to their mains. Asked as to the effect of an escape when the road was solid above, witness explained that the wood was placed upon the concrete, and was generally grouted with pitch, which really made it impervious to gas—in fact, it hermetically sealed it, and asphalte, of course, naturally did so to an even larger extent. It meant that the gas escaping from the main from any cause whatever could not come to the surface as it would in an ordinary macadamized or ballast road, but went laterally and found its way into basements and vaults of houses abutting upon the road. This was a very much more serious thing than an escape simply going away into the open air would be.

Coming to the question of the effect of heavy motor traffic on the Company's pipes, witness said: Unquestionably, though the weight of the heavy motor itself is not directly placed on the mains, because generally the roads are paved now in the way we have been speaking about, we do receive very great injury from the excessive vibration and tremor caused by the quick transit of these heavy motor cars.

We feel this through the new solid-made concrete roads quite as much as under the ordinary macadam. I should say that there would be absolutely no difference. I think I can prove that in this way: In my own office I have a lot of speaking-tubes going into various parts of the building in the Goswell Road. There are a large number of heavy motors from Carter, Paterson, and Co.'s depôt close by. The vibration caused by these motors passing will set the mouthpieces of the whole of these speaking-tubes rattling. So that if the rattling is conveyed right up into a heavy solid building, it is perfectly apparent that it must equally reach the mains; and our experience is that it does so. The offices are also a very important distributing station. There are large mains bringing gas under high pressure from our works at Beckton to be redistributed at a pressure suitable for the consumers' requirements. Naturally we have a very large number of mains there, and it is a road with very heavy traffic. With these heavy motors, the effect of which, as I tell you, we can feel by the rattling of the speaking-tubes, we have a great many escapes; and we have lately been at work in the Goswell Road itself entirely on that account. This is a state of things which causes us great apprehension, from the possibility that at any time we might have a very violent explosion and accident.

[Witness gave particulars of the suffocation of three persons in the Kingsbury Road, Ball's Pond Road, and of two in Little George Street, Euston Road, owing to the permeation of gas into the premises.]

I have extracted from the Company's records the number of broken mains and drawn joints which had to be remedied in leading thoroughfares only (in all cases excluding side streets) which were dealt with each half year for the past 6½ years. They are as follows:—

Year.	1899.	1900.	1901.	1902.	1903.	1904.	1905.
June half	58	91	152	328	180	187	429
December half	29	46	202	307	113	261	..
Total	87	137	354	635	293	448	..

We seem to be getting to a figure which is likely to reach about 800 this year [1905]?—I am very much afraid so, against 87 in 1899. This does not represent the number of escapes we have had all over our area. I have only picked out for the information of the Commission escapes dealt with in leading thoroughfares where we believe that heavy motor traction is the cause. I have not taken side streets at all. I attribute all these cases to heavy motor traction—not so much to the

actual weight, as to the vibration and tremor set up by the excessive speed of such heavy vehicles.

In Piccadilly we dealt with six leaky joints and one breakage in the year 1899, and in the year 1904 with no less than 17 leaky joints and six broken mains; and in Oxford Street, in 1899, with one leaky joint only, whereas in 1904 we had to deal with 22 leaky joints and two broken mains. There is absolutely nothing to which to attribute these leaky joints and broken mains except heavy motor and traction-engine traffic. It is caused by steel-tyred vehicles at any rate. Where the vehicles have resilient tyres, the effect is reduced; and I think I might go so far as to say that this would probably meet our objections. We are not here as a Gas Company to scotch anything which might conduce to the public convenience by means of such vehicles; and if our objection could be met by their having tyres of a softer description, we certainly would withdraw our opposition to them.

In answer to further questions, Mr. Foulger said the main element in causing vibration was speed; but it would be very difficult to define the speed which a heavily weighted iron-tyred vehicle should be permitted to attain. He could only point to the fact that as they had increased in weight, there had been an increase in the number of escapes. He added that he would hardly like to take the responsibility of defining a speed for a 12-ton vehicle, as there were so many considerations; but eight miles an hour would certainly be too much.

The Chairman then referred to the existing underground constructions, such as electric lighting boxes, and asked whether they made escapes of gas more dangerous. Witness replied: Most decidedly; as there are are so many hollow places now. For instance, there are the telegraph and telephone boxes, the electric lighting boxes, and the transformer chambers, all of which are supposed to be constructed gas-tight; but it is almost an impossibility to do so. If they are constructed originally gas-tight, they do not remain in this pristine condition; and with regard to electrical transformer chambers, it is quite unnecessary to find a light from outside to cause an explosion, because there is so much sparking taking place in the chambers that the air within them forms the explosive mixture, a spark forms the torch, and away the whole thing goes.

The next subject taken up was the effect of steam-rollers; and the Chairman asked Mr. Foulger if he found that they did mischief. He replied: I have no fear of a steam-roller going over the road *en route* to the place where it is going to work, but a steam-roller at work is a most dangerous thing for pipes, for this reason: First of all, by picking up the natural crust which has been formed for some years, they make a break in the arch which has been consolidated by the traffic; then they saturate the soil with water to make it as soft as pap; then they put the roller on, and this is pounding backwards and forwards, and anyone looking at it can see the road receding in front of the roller with wave-like motions. So that the conditions under which a steam-roller is actually at work in a street are totally different from those when the roller is simply passing along a street. It is very slow in its passage, and I would not fear it. I may go so far as to say that, in the whole of my experience, I have never been able to trace a breakage to a steam-roller unless it has been actually at work, and they are frequently passing through the streets to get to the place where they are to work.

Sir David Harrel then put this question to the witness: Is it your idea that a lighter roller should be used for the preliminary process. The finishing of the road afterwards, I presume, would not be attended with the result which you have just described? Mr. Foulger replied: No; not the finishing. We are dead-against steam-rollers altogether. We took proceedings against two important Vestries, as they were then—St. George's, Hanover Square, and St. Mary Abbott's, Kensington—in the year 1884, and we got injunctions against them. They were not allowed to use rollers of the weight they first introduced, which was 15 tons. The injunctions restrained them from using any rollers heavier than 10 tons, and placed the onus upon them for any damage that even a 10-ton roller did. So that we have to recognize them in a way, but we do not like them. Of course, it is a very important matter, and is becoming more so every day, to consolidate these roads as quickly as possible, and we quite recognize this. Still, it is possible that in a position where a 10-ton steam-roller was dangerous, a 5 or 6 ton engine would not be dangerous.

The Chairman asked whether the increased vibration caused by heavy motor traction acted prejudicially also in silting away the dry soil underneath the roads; and the witness replied: That is so; and it is really a very serious thing for us. The Commissioners will realize that under the roads about which we are now speaking—viz., wood and asphalte on concrete—the soil must naturally be dry, because every shower of rain which comes down runs off the road and down the gullies, not as it would be on macadam roads, or roads such as you have in the Park, where the rain would soak in. The road is all water-proof, the same as it is gas-proof; and the rain runs away down the gullies and leaves the soil very dry. There are so many things under the streets of London now—such as gas-pipes, water-pipes, fire-hydrants, fire-alarm wires, and electric light wires—that we cannot get very much space between each of the pipes, only 2 or 3 inches in many instances. If we could depend upon our always maintaining the original relative distance between each pipe, we should not receive damage from electric lighting wires for instance; but when these heavy vehicles are going over the roads and silting the soil away, it naturally follows that the cables begin to settle, and come into contact with the gas-mains, and we have in consequence had a great many serious cases of fusion.

Sir William Forwood was the witness's last questioner. He referred to the jointing of pipes, and said that the Hydraulic Power Company, of which he is a Director, had not had any trouble such as that mentioned by Mr. Foulger. He asked whether it would be possible to adopt the Company's form of joint in the principal streets. Witness replied that it was not possible. He added: I am well acquainted with the joints you make; but you must recollect that yours are specially and necessarily very strong pipes. You have to withstand a very great pressure—700 or 800 lbs. on the square inch, and often much more. If in the case of a 48-inch gas-main we used a flanged joint, such as you employ, and bolted it together in the way you do, if there was such a strain that something had to go, the pipe itself would go in preference to the joint; and this would be disastrous in our case. In the way we joint our pipes with the ordinary spigot and socket, it means that whenever there is a tendency to subsidence the pipe has a tendency also to bed and accommodate itself to the settlement by slightly drawing the joint; and so we decidedly welcome it. If, for instance, it were possible to have one length of cast-iron pipe as long as the road itself, that would be a most dangerous thing, because we should not have the facilities for expanding at the joints that we have with our present method.

COMMERCIAL GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. G. Bradshaw in the chair.

The Secretary (Mr. H. D. Ellis) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

PARLIAMENTARY BILLS AFFECTING THE COMPANY'S INTERESTS.

The Chairman, in moving the adoption of the report and accounts, said: Gentlemen, I have so often had occasion to address you at considerable length at these meetings, that it is a great relief to me, as I am sure it will be to you, that very little has transpired during the half year under review which calls for special comment. The little I have to speak about, I think you will regard as satisfactory. During the last session of Parliament, there were three Bills which affected this Company's interests. The London County Council promoted a Bill authorizing them to supply electricity for power purposes in bulk. This Bill would have affected this Company prejudicially both as ratepayers and as trade competitors. I am happy to say the Bill was not passed; but I fear, at no distant date, it will be revived in a somewhat modified form. The London County Council in their General Powers Bill also inserted clauses, authorizing the Borough Councils to wire the houses of intending consumers of electricity; and these clauses were passed. The Gas Companies, however, succeeded in getting protection to the extent that it was enacted that no part of the expense should fall upon the rates—that is to say, the wiring business is to be self-supporting. Then the Government Trades Disputes Bill affected this Company as well as other employers of labour, inasmuch as for the first time it was proposed to legalize what is known as "peaceful picketing." I think you know what peaceful picketing is. Well, that is legalized now by the Government Trades Disputes Bill. But as far as this Company are concerned, I do not think we need fear any evil results at all, because our relationship with our workmen is so excellent in every respect; and beyond that the men have a large interest in the Company acquired through the profit-sharing system. Therefore I do not think we need fear a strike.

SUPERSTITION AS TO PURIFICATION.

This half year is the first that has passed under the new conditions of gas testing enacted by the London Gas Act of 1905. As far as our consumers are concerned, I do not think they have been aware of any change; at any rate, they appear to be thoroughly satisfied with the way in which the Company serve them. But I must say the Act has been a great relief to our Engineer and the Managers of the various works; and it has been a source of saving to the Company, of which five-sixths go to the public. It is worthy of note that the benefits of the Act have been extended during the last session of Parliament to numerous provincial companies, mainly through the exertions of Mr. Henry Jones and Sir George Livesey. I mention this because it indicates that the old superstition as to the necessity for excessive purification of gas is at last dead. May it rest in peace.

INCREASED PROFIT AND ITS SOURCES.

Outside the Company, there is nothing else of any interest or importance; but I should like to draw your attention to our own internal affairs. The accounts, I think you will agree, indicate that the half year has brought with it an unusually large increase of business, and a very satisfactory balance of profit. The net profit, as you will see by looking at the net revenue account, amounts to £62,311; and in the corresponding half year, it was £55,717. That is an improvement of £6594. At the end of last half year, we were short of our dividend by £3231. On this occasion we have earned the dividend we recommend, and have a surplus of £1936. To show how this improvement has been brought about, if you turn to the receipt side of the account, you will see that the total receipts amounted to £249,598—that is an improvement of £16,186, made up of £9320 additional receipts from gas, £2562 more from rental, and £4295 larger receipts from residuals, of which coke has given a further £3824. During the half year, we sold 85½ million cubic of gas more than in the corresponding period of 1905—that is, an increase of nearly 6 per cent. I think this is a record in the Company's history. The South Metropolitan Company had an increase of nearly 3 per cent.; and the Gaslight and Coke Company, one of nearly 4 per cent. So that you see this Company did better than either of the other two. I need not tell you that this increase is mainly due to the large number of additional coin meters and stoves which we fixed in the preceding half year. This leads me to mention that during the half year ending June 30 last, there were connected 3772 additional stoves, bringing up the number on hire in our district to 42,109. There were also fixed 5097 coin meters, making the number 50,321; and I am happy to inform you that the demand for coin meters shows no sign of falling off. While the receipts were £16,186 more, the expenditure was higher by £9592. This extra amount is made up of various items which do not call for special comment except the one of "rents, rates, and taxes." You will see this has been brought up to £12,261; last year, in the corresponding period, it was £11,409. Dissecting the item, the amount paid for rates in the first half of last year was £9963; and in the past half year £11,734—that is, an advance of £1771 for rates. I take it,

gentlemen, you have all seen the reports which have appeared in the public Press of the Poplar Board of Guardians inquiry; and therefore you know pretty well where the money has gone. I hope it is satisfactory to you. (Laughter.) Turning to the net revenue account, you will see we brought forward £17,473; and to this we add the balance of profit £62,311, which gives us £79,785. Deducting from this the interest on the debentures and on bankers' loan (which together amount to £8850), there is left available for dividend £70,935. We recommend to you the same dividend as usual—that is, £5 4s. on the 4 per cent. stock, and 5 per cent. on the 3½ per cent. stock, both less income-tax. This will absorb £51,525, and leave £19,410 of undivided profit to carry forward to the current half year.

PRICE OF GAS.

It would have been a source of unmixed satisfaction to your Directors had they been able to recommend a reduction of the price of gas. But inasmuch as 1d. per 1000 cubic feet costs the Company £12,754 per annum, or £6377 in the half year, you will see that the surplus is insufficient, and had we reduced the price we should not have been able to make both ends meet. I would remind you also that in two succeeding half years there has been taken from undivided profits £7876; and during the last two half years we have only been able to replace £3169. Moreover, in the spring when the coal contracts were renewed, we had to pay considerably more for coal; and the coal market at the present time is very uncertain. Putting all these reasons together, it will be seen that it was impossible for us to recommend a reduction in the price of gas. Looking forward, I think we may expect that the current half year will be a fairly prosperous one; and I hope if we have the pleasure of meeting you in February next, we shall have as good a report to present as the one which I have now the honour of submitting for your adoption.

Mr. H. E. JONES seconded the motion, which was unanimously agreed to.

The CHAIRMAN next proposed, and Mr. H. E. JONES seconded, the declaration of a dividend at the rate of £5 4s. per cent. per annum on the 4 per cent. stock, and of 5 per cent. per annum on the 3½ per cent. stock.

The proposition having been carried,

A cordial vote of thanks was passed to the Chairman and Directors, on the motion of Mr. M'NAUGHT, seconded by Mr. SOUTTER.

The CHAIRMAN, replying for himself and his colleagues, thanked the proprietors sincerely. He remarked that the fact that no question was asked on the report and accounts showed that the proprietors were satisfied with the condition of the Company. In accordance with the usual practice, he should like to move a vote of thanks to the staff who served the Company so ably and well. He thought he had said before that the Company had a young staff; and he was very pleased this was the case, because they found what they expected—that a young staff gave them most energetic and enthusiastic service. Never had their service been more satisfactory than during the past half year. Gas companies had nowadays to do more work for less money than in the good old times, seeing that they sold gas in pennyworths, and it gave more trouble to distribute the gas, and more trouble to collect the money. But the service they had had from all classes of their employees—from the Secretary and the Engineer to the general staff, and to the humblest worker in the yard, was of an entirely satisfactory character to the Board.

Mr. H. E. JONES seconded the motion with the greatest pleasure; and it was cordially agreed to.

Mr. ELLIS, in acknowledging the vote, said not as the youngest member of the young staff to which the Chairman had been so good as to refer, but as the *doyen* of that staff (he had been with the Company now nearly thirty years as Secretary), he had much pleasure in thanking the proprietors for their kind recognition of their services, such as they had been. The members of the staff had all done their best; and he was glad that what they had done had given satisfaction. He asked to be also allowed to congratulate the proprietors upon the extremely successful half year the Company had had; and he expressed the hope—and it was a somewhat confident one—that the next half year might be found equally successful or very nearly so. He should also like to say a few words—as they would give a sort of finish to what he had said on previous occasions—as to the law cases which concerned companies like their own. In the last of these cases, which he mentioned to the proprietors some years ago, it was sought by an action-at-law to impose upon an innocent company the responsibility for losses which arose from a matter over which they had not the slightest control. This matter had at length been decided, after a struggle going on for nearly three years—it was certainly more than two-and-a-half years since the judgment of the King's Bench Division. The case was that of *Ruben and Ladenberg v. The Great Fingall Company*. After this long contest, the Company had emerged triumphantly from the House of Lords. The Lords delivered a decision in their favour in the most emphatic terms—more emphatic than their calm Lordships usually indulged in. It was of interest to the proprietors, because it was a matter that might have happened to their own or any other company. It was a question of forged transfers; and the decision of the Lords would govern all similar cases in future.

Mr. STANLEY H. JONES, on behalf of the engineering staff, also cordially thanked the proprietors. He said he could endorse all that Mr. Bradshaw had said regarding the staff. Nobody was more pleased with the satisfactory results of the half year than the officers and staff of the Company. The proprietors would be gratified to know that the Company's property and plant had never, he thought, been in a more satisfactory or efficient working condition than now. He believed with the Chairman that the results of the present half year would be as satisfactory as those of the past one.

This concluded the proceedings.

Messrs. George Glover and Co., Limited, have just completed an order for six 500-light dry meters for use with six Crossley gas-engines, in a colliery in the North of England.

TOTTENHAM AND EDMONTON GASLIGHT COMPANY.

The Annual Ordinary General Meeting of the Company was held last Saturday at the Gas-Works, Willoughby Lane, Tottenham—Mr. CORBET WOODALL in the chair.

The SECRETARY (Mr. James Randall) read the notice convening the meeting; and the report and accounts for the half year ending June 30 were taken as read.

THE RESULTS OF THE HALF-YEAR'S TRADING.

The CHAIRMAN, in moving the adoption of the report and accounts, said the half year just closed had been one of unusual importance to the Company, and, he thought, of especial interest to the proprietors. He would deal first with the report and accounts, which the Directors asked the proprietors to adopt, and then he would make a few observations on the Act of Parliament which had received the Royal Assent since last they met together. The result of their trading had been remarkably good. There had been again a great increase in the quantity of gas sold; the output amounting to 60 millions more than in the first half of last year, which increase was equal to 12½ per cent. A little of this might be due to a variation in the time of taking the indices at Christmas last, for which he thought a sufficient adjustment in favour of that quarter was not made. Attention was called at the last meeting to the large percentage of gas unaccounted for; and he then said that this half would show a different record. His anticipation had proved correct, as the loss stood at less than 3 per cent. in the accounts for the past six months, as against nearly 8 per cent. for the preceding half year. The latter was too high, and the figure for the past half year too low, for the reason he had given. The revenue from the rent of meters, stoves, and fittings followed that for gas, and exhibited a substantial increase. Residuals had shown little change, except that coke brought a price less by nearly 1s. per ton than in the corresponding half year. In the current half, the Directors expected better results, both as to quantity and price. The gas revenue was greater than last year by £5600, and would have been £9200, but for the reduction in the price. On the expenditure side, £1800 more had been paid for coal and oil. The price of coal was higher by 5d. per ton; but because of better carbonizing results, the charge for materials per 1000 cubic feet made was less. All the other items under the heads of manufacture, distribution, and management, showed improvement—in each the cost per 1000 cubic feet was less. An exception was found only in the case of repairs and maintenance of works. He believed that a year ago he expressed an opinion that this charge was on the eve of reduction. If so, the forecast was erroneous. The Directors and officers were keen to effect true saving, but would run no risk in letting works or plant depreciate, or of putting upon capital burdens which revenue should rightly bear. The charge, however, was a heavy one, and would come down. With his recent failure in prophesy before him, he would refrain from again fixing a period. The revenue account showed a profit earned in the half year of £17,433. Deducting from this the debenture and other interest charges, there remained £13,200. Out of this, the Directors recommended the payment of dividends of 6½ and 5 per cent. on the respective stocks; thus disposing of £12,698. Of the balance, £1000 was added to the insurance fund; and the remaining £500 went to increase the undivided balance of the net revenue account. The Company's reserves now amounted to £47,000.

THE CAPITAL ACCOUNT.

The expenditure on capital account during the half year had been £10,000; and the Company had still £24,000 of the old capital and debenture stock unissued. Of this, the balance of the "B" stock would probably be offered for sale in October next; the amount of the balance being £11,533. The capital employed, in relation to gas sold, again showed a reduction. Taken as a whole, the record of the half year was a very good one. He believed they would be able to live up to it in the future; and, unless the unforeseen happened, they might, with confidence, look forward to announcing a further reduction in the price of gas at an early date.

THE NEW ACT.

As he had said, the past half year had been one of peculiar interest. The passing of the new Act of Parliament marked an epoch in the history of the Company. In its final form, the Act varied very little from the Bill as originally deposited. The main provisions were as follows: The Company had power to raise £600,000 by new stock, which would be subject to the same conditions as to dividend as the present "B" stock. They might also issue £200,000 of debenture stock, selling it by auction or tender. This total sum of £800,000 was calculated to meet the needs of the Company, and the demands of the consumers, for about fifteen years. In 1898, because of the attitude of the Local Authorities, they obtained power to raise only £200,000 in all, with the result that, in seven years only, they were obliged to renew their application to Parliament. Before publishing the notice of their intention to apply for a new Act, the Directors instructed Mr. Richards to purchase for them the property adjacent to the works, and known as Willoughby Farm, and also certain marsh lands giving access from the existing works to the River Lea. The purchase was effected on fairly reasonable terms. The price would probably have been considerably higher if the lands had been first scheduled to their Act. The lands were purchased by the Directors themselves, and would in due time be handed over to the Company. The area purchased is: Willoughby Farm 71 acres, and marsh land 9 acres—in all 80 acres. The Company had obtained permission from Parliament to manufacture gas upon 22½ acres of the land; and, for the present, they would hold the balance in reserve. Some portion of it would no doubt be let, but this the Board had yet to decide. They would probably be able to build works on the scheduled land, sufficient to last until the new capital was exhausted. With regard to the illuminating power of the gas, the standard of 14 candles (minimum) had now been restored. The change would not be observed by their consumers any more than was the change from 14 to 15 candles which

was made in 1898. As he explained at the meeting held six months ago, so large a proportion of the gas that the Company supplied was now used for purposes where heat was the first consideration, that a high illuminating value was of less importance than formerly—it was, indeed, an extravagance. The alteration would slightly cheapen the cost of making gas, the advantage of which would be divided between consumers and shareholders in the proportion of seven to the former and one to the latter. The obligation to remove from the gas sulphur other than sulphuretted hydrogen had been annulled. He spoke of this at some length when they were considering the Bill in February, and so need not go over the ground again. The alteration was an advantage all round. The Company's application to supply a special non-luminous gas for power purposes had been granted. Whether they would find a demand sufficient on terms satisfactory to users and to themselves, they would know shortly; but he should have to refer again to this question on a later occasion.

THE LOCAL AUTHORITIES AND THE ACT.

The proprietors would have seen from the report that the Act, though including an unusual number of matters suggestive of controversy, had been passed without opposition in Parliament. To the Directors this had afforded great satisfaction, which he thought the proprietors would share. The Board had had several conferences with the Urban Councils; and, after a few modifications in the Bill, and some concessions outside it, they came to agreement with each of them. As a result, the Company had saved some expense, and the ratepayers considerable expenditure. He thought, too, the relations of the Company with the Municipal Authorities had been improved rather than otherwise.

THE OUTER CIRCLE RAILWAY.

A Bill to authorize an Outer Circle Railway, extending from Feltham to the London and India Docks was again before Parliament this session; and as the promoters proposed to occupy a large portion of the land which the Directors had just purchased for the extensions of the works, the Board were obliged to enter an opposition. The Bill occupied a considerable time in Parliament; and the Directors' position in regard to it was a somewhat anxious one. Eventually, however—after terms had been arrived at, securing the Company proper access to their lands as they would be ultimately occupied, and adequate compensation for the land to be surrendered—the Bill was rejected by Parliament.

THE LATEST ADDITION TO THE WORKS.

The new works were now practically completed; and the proprietors would be able to see much of the plant in operation after the meeting. A considerable amount of capital had been expended, though not more than proportionate to the growing demand. He was glad to say that the charge upon the gas for dividend and interest was, with only one exception, lower than that of any Metropolitan or Suburban gas company. He need hardly say that the satisfaction of the Directors was great, at being able at the same time to reduce the price of gas and to increase the dividend. They would not have done either the one or the other unless they had seen their way pretty clearly to the maintenance of the lower price and the higher dividend. He thought, on the whole, that the report was the very best it had been his pleasure, over a long course of years, to present to the proprietors.

Mr. HENRY BAILEY seconded the motion, which was carried without discussion.

INCREASED DIVIDEND.

Mr. G. T. WATSON moved the declaration of dividends at the rate per annum of 6½ per cent. on the "A" stock, and 5 per cent. on the "B" stock, both less income-tax. He remarked that it was very gratifying to the Directors that their anticipations with regard to the result of the half-year's working had been realized, and that they were able, in spite of the reduction of 2d. in the price of gas from Jan. 1 last, to report that they had recouped that, and were able to pay an extra ¼ per cent. dividend. They must not be too sanguine about it, but the Directors hoped to be able to continue this.

Mr. JAMES CLOUDSLEY seconded the motion, which was unanimously carried.

Mr. WATSON next proposed the re-election of Mr. Corbet Woodall to his seat at the Board. It was, he said, quite unnecessary for him to say what advantages were to be derived from having a gentleman on the Board who had such great knowledge of the gas industry and such professional ability. Mr. Woodall gave most ungrudgingly of his valuable time to the work of the Company, and without doubt had contributed very largely to the prosperity they now enjoyed.

Mr. BROWN seconded the motion, which was very heartily carried.

The CHAIRMAN thanked the proprietors for their confidence in him; and then moved the re-election of Mr. James Cloudsley.

Dr. SCOTT seconded the motion, which was also cordially agreed to.

Mr. CLOUDSLEY having replied,

Mr. J. L. Chapman, the retiring Auditor, was re-appointed, on the proposition of Mr. W. H. LANG, seconded by Mr. OSBORN.

Mr. W. B. RANDALL (Waltham Cross) proposed a vote of thanks to the Chairman and Directors, remarking that where a policy of studying consumers, as well as proprietors, was followed, success was sure to be achieved.

Mr. CHAPMAN, in seconding, said the growth and success of the Company had been wonderful. He believed he was one of the oldest proprietors present; and it was a great pleasure to him to see the Company going forward as it was doing, and to feel that it was so magnificently managed.

The motion was passed by applause.

THE WORK OF THE OFFICERS AND EMPLOYEES.

The CHAIRMAN, in acknowledging the vote on behalf of the Board, said both his colleagues and himself appreciated the vote very much. He knew they all tried their very hardest to succeed; but it did not fall to the lot of everybody who tried very hard to make a success in the estimation of others. The approval of the proprietors was ungrudgingly given to them; and the Directors were glad, from year to year, to see the growth in the business of the Company, and its prosperity. He should like to move a vote of thanks to the officers and their staffs; and he was sure the proprietors would wish him to add the workmen. This resolution would have come with more effect after the proprietors had made a tour of the works. He (the Chairman) had spent two or three hours upon them that morning; and it was the first time he had seen the whole of the new plant working. He was exceedingly pleased with the way in which the extensions had been carried out. The Directors had during the day expressed their congratulations to the Engineer upon the completion of this portion of his work. On this occasion, he had mentioned Mr. Broadberry first because this was a works' meeting, and the Directors were gratified with the considerable extension that was now practically completed. With regard to Mr. Randall and his staff, it was difficult to find fresh words in which to speak of the Secretary's constant devotion. Neither time nor effort on his part was ever lacking. As to the workmen, the readiness and willingness with which their work was done, and the interest they had taken in the alterations at the works, spoke well not only for their attachment to the Company, but also for their intelligence.

Mr. E. CROWE seconded the motion, which was unanimously carried.

Mr. RANDALL having sincerely thanked the Chairman and proprietors on behalf of himself and his staff,

Mr. BROADBERRY also responded. Speaking of the works, he said it was now some six years ago that it was obvious that the whole works would have to be reconstructed and extended, owing to the constant increase in the demand for gas. It was therefore necessary to commence a scheme of reconstruction on an extensive plan, embracing the whole of the site. He felt he was then face to face with a great deal of responsible work; and during the period of consummating the scheme, there had sometimes been anxious days. However, he had always had the gratification of feeling that he had the Directors' full support; and now the knowledge of their appreciation and satisfaction was very gratifying to him, and those of the members of his staff who had been particularly associated with him in the work.

The proprietors then had tea, and subsequently a tour was made of the new section of the works, under the guidance of the Chairman and Engineer. The mechanical handling of the coal and coke, the charging and discharging of the retorts by the De Brouwer machinery, and the operation of the carburetted water-gas plant were features of great interest to the proprietors. The new section of the works was described in the "JOURNAL" for Feb. 13 last, and reprints of the description were addressed, prior to the meeting, to the whole of the proprietors.

WANDSWORTH AND PUTNEY GAS COMPANY.

A Jubilee Meeting.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the Offices, North Street, Wandsworth—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. Chas. W. Braine) read the notice calling the meeting; and the Directors' report and the accounts were taken as read.

INCREASED DIVIDEND AND TWO-SHILLING GAS.

The CHAIRMAN said it became his pleasant duty to move the adoption of the report and accounts. To refer first to what was always the most essential thing: The proprietors would notice the modest suggestion of the Directors, that dividends should be declared at the statutory rates, in accordance with the present reduced price. The Directors did not mention this fact in the report (but perhaps the proprietors had already anticipated what he was going to say), that the dividend was an advance of two one-eighths per cent., to which they were entitled on the converted old capital and on the new capital in consideration of the two pennies by which the price of gas was reduced last January. The Board made this reduction somewhat in anticipation of possible difficulties in recouping it, because they had already asked the Local Authority to waive that requirement of purification which was giving their officers a great deal of trouble, and causing the Company some little extra expense; and it was thought that, putting the trouble and the expense together, probably if the officers were relieved of their anxiety, a little more profit might be realized, and so enable the Directors to reduce the price of gas. They "took the bull by the horns;" and so they occupied the position in this part of England—giving a 10 per cent. discount on gas used for power purposes—of supplying the lowest priced gas. The Company had been a long time coming down to the 2s., which was also the price charged by the great and successful South Metropolitan Gas Company, who were their neighbours eastward on the south side of the Thames. Fortunately, things had panned out all right. The Company were able not only to stand this loss of income by the reduction, which meant nearly £4000 in the half year (or £8000 a year), but they had been able to get within a little of the extra required for dividend—£420—which was a trifle over one-tenth of the amount of the reduction, and so they were enabled to give the full statutory dividend in agreement with the parliamentary scale.

COMPANY'S JUBILEE.

Before turning to the balance-sheet, he should like to tell the proprietors that this was the jubilee year of the Company. The Company's first Act was obtained in 1856; and so meeting in August, 1906, they had attained their jubilee. This was a short history compared with some gas companies. But there was no history that had been much more prosperous and successful; and certainly there had been no history of any gas undertaking with which he had ever been identified that had throughout been so pleasant and so recurrently satisfactory by its progress as this one. The proprietors knew that it was his practice to call the Company "a family one." Over the mantelpiece in the Board-room was the likeness of the late Dr. Howell, whose father had

founded the Company; and he (the Chairman) had as his deputy Dr. Howell's eldest son (Mr. T. A. Ives Howell) and also as a colleague on the Board his second son (Mr. J. Bromley Howell), both of whom they all hoped would help, for very many years to come, to continue the prosperity their grandfather initiated.

CAPITAL AND REVENUE ACCOUNTS.

If the proprietors would now turn to the capital account, they would see that only the modest addition of £1145 had been made to it. Of this sum more than half was accounted for by a pontoon, which was a large derrick floating on the river, and, being on the river, would disappoint the rating authorities, because they would not be able to nobble the £600 spent to enable the Company to discharge their coal. Their capital, when the addition was allowed for, worked out to the extremely small amount of 6s. 11¾d. per 1000 cubic feet of gas sold; and such a low figure was what he, personally and professionally, always held was the keystone of the prosperity of a gas company. In their own case, it enabled them to supply gas cheaply, and yet to earn the profit required to pay the full handsome dividends that the proprietors received. They were handsome, because on the original capital the dividends had to be doubled. This was due to the great economy, and the great foresight, that had directed the expenditure of capital in the undertaking. With regard to their trading during the half year, the income had been increased from £75,000 to £76,400, chiefly by the addition to the selling value of coke, because necessarily, having reduced the price of gas, the income from this source was not so great as it was by some £700 or £800. Coke, however, had realized an increase of £1400. But the profit had diminished from £13,950 to £13,042. Bearing in mind, however, the loss of £4000 by the reduction in the price of gas, it would be seen that their officers had done well to get within £900 of the profit of last year. Of course, the sale of a larger quantity of gas was involved in realizing the £4000. The increase in the sales was 6·8 per cent., which compared well with the increases obtained in the Metropolitan area, which were all smaller than their own, excepting in the case of the West Ham Company. The increase involved making extra gas, and further expenditure for coal, other material, and labour. There had been, he was glad to say, a small saving upon purification, as they anticipated there might be; and coupling this with the increase from coke, they had been able, as he had said, to obtain a profit of £13,042, which justified the Directors in recommending dividends at an advanced rate.

TAR FOR ROAD MAKING.

With regard to residuals, a very eminent Gas Engineer had pointed out that tar ought to be worth a great deal more. It was interesting to follow the history of tar, because some years ago, the Company got 4d. per gallon for it, and now they only received 1d. The subject was largely attractive, because tar was well known to be the parent of a numerous number of valuable things besides the colours which Dr. Perkin made his own province. It was stated that investigations and statistics showed that something like 20 millions was the real manufactured value of the tar produced, whereas only 5 millions represented the value to the gas companies who produced the tar. So that, it was seen, there was an enormous value realized somewhere; and it did not come to the gas companies, largely because, Sir George Livesey thought, they produced a great deal of tar in endless directions, and so had overdone the market. There was more tar than the distillers required; and therefore they could shut the gas companies out from participating in their big profits. Now, however, owing to the intolerable dust created by motor-cars, there had been a tendency to apply tar to improving the surfaces of roads, and so prevent the dust from rising. Before motors came into existence, the Corporation of Glasgow bedded their pitching-stones in tar; and in Wandsworth they were long ago successful in making tar pavements—tar and stones mixed—which were mostly used for side pavements, and made durable and dustless ones. It seemed to him that, within a moderate limit, there would be an improved profit arising from this source. He would, however, like to take this opportunity of warning those engaged in the gas industry against charging too much for tar so used. In two cases lately (he would not mention the names, but he happened to be connected with the Companies), he found they were charging more to the tar paviors than they were getting from the tar distillers. This appeared to him to be a wrong policy, and one that was likely to prevent the development of this particular outlet for tar.

GROWTH OF CONNECTIONS.

Reverting to the increased sale of gas, he said it had been accompanied in the half year by the addition of 318 ordinary meters, of 356 stoves, and of 411 slot meters. In this direction, the Company had kept up a steady progress. They had taken no heroic steps to secure the development; but they had met the demand freely and liberally as it came. They had, at the present time, something like 14,500 slot-meter consumers, as against 9000 ordinary consumers; and between them they contrived to employ 18,600 stoves. It would therefore be recognized that the Company turned no blind eye to the requirements of their district.

WARNING SHAREHOLDERS AGAINST DOUBTFUL COMPANIES.

There was one matter which it had been suggested he should call attention to. That was to warn shareholders in prosperous undertakings like their own against the invitations to subscribe capital to rotten little concerns, which were only important in the amount of money they asked in their prospectuses for the acquisition of insignificant works. To these prospectuses there was generally attached a map showing a large area, which the small gas-works could never possibly light, but, in fact, was largely unlightable on anything like reasonable terms. In this way, to his own knowledge, a good many innocent people had been led into subscribing capital, while there was not the slightest hope of realizing anything like proper dividends, if any at all. These proceedings (which he could hardly sufficiently condemn) had been noticed and severely commented upon by the technical journals; but those journals did not always reach the eyes of gas shareholders. He had that very day instructed the Secretary to consult their Solicitor as to whether he (the Secretary) need supply the holder of one class of stock with the particulars of the names and addresses of their shareholders, so that they could be flooded, as they had been many times in the past, and as he and every member of his family had been who were shareholders in that and other gas undertakings, with circulars, which, of course, he committed to the waste-paper basket, but upon which more confiding people might be led to part with their money. A report of this meeting would be sent to all the shareholders; and he hoped these words of warning would be seen by all who were not present to hear them.

The DEPUTY-CHAIRMAN (Mr. T. A. Ives Howell) seconded the motion, which was unanimously carried.

On the proposition of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, dividends were declared at the following statutory rates per annum: On the "A" consolidated stock 8 per cent., on the "B" consolidated stock 6½ per cent., and on the ordinary "C" stock £5 12s. per cent.

PRICE OF THE COMPANY'S STOCK.

The CHAIRMAN said he intended to have stated, with regard to the price of their stocks, that he was not at all satisfied with the market prices. He hoped that, if any of the proprietors contemplated selling any of their stock, they would be careful to see they obtained the best price for it. There was no better investment than gas on the face of the earth; and some people thought him a judge of these matters. Therefore he did not care to see their stock sold or quoted on the Stock Exchange to pay any better return than that of the best gas stock procurable. This came home to him, because it would be seen they had wiped off some of the temporary loan they had from the bankers, which last year stood at £20,000, and had now been reduced to £7000, which they would soon get rid of through the recent issue of £10,000 of 3 per cent. debenture bonds. For that issue, they had not got par price; but he ventured to say the day was not far off when they would get par for similar stock, and when the proprietors would procure higher prices than those quoted in the official list.

On the motion of Mr. J. C. BADCOCK, C.B., seconded by Mr. JOHN HENNELL, a vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, having acknowledged it, proposed a similar compliment to the Secretary (Mr. C. W. Braine) and the Engineer (Mr. H. O. Carr). He praised their assiduous and painstaking work, and mentioned that last year the Board, with the sanction of the proprietors, increased the salary of Mr. Braine, and this year, the proprietors would be equally glad to know, the Directors had raised the emoluments of the Engineer.

Mr. H. S. FREEMAN seconded the motion; and it was heartily agreed to.

Both Mr. BRAINE and Mr. CARR expressed their thanks, and the proceedings terminated.

POSITION OF THE KENT COUNTY GAS COMPANY.

In a paragraph reproduced in the "JOURNAL" last week from the "Daily Mail," it was stated that a notice had been issued for a statutory meeting of the above-named Company, and that in connection with it certain particulars had been furnished in accordance with section 12 of the Companies Act, 1900. The shareholders were informed that the total number of shares allotted to date was 5834; that 2438 ordinary shares and 2020 preference shares had been paid up in full; and that 1342 shares were partly paid up to the extent of £2301 10s. Upon 7 preference and 27 ordinary shares no payment had been made. The total amount of cash received by the Company was £24,591 10s. The abstract of the receipts and payments on capital account to the date of the report was as follows:—

Receipts.

2438 ordinary shares of £5 each, paid in full	£12,190	0	0
2020 preference shares of £5 each, do.	10,100	0	0
791 ordinary shares, partly paid up	1,338	10	0
551 preference shares, do.	963	0	0
Total	£24,591	10	0

Payments.

Purchase of property	£21,800	0	0
Legal expenses and stamps for transfer of property	210	6	6
Total	£22,010	6	6

Appended to these particulars were the names, addresses, and descriptions of the Directors; among them being Mr. S. B. Darwin, who, as our readers may remember, some weeks ago sent in his resignation. Mr. Darwin, who was desirous of severing his connection with the Company, was evidently annoyed at finding his name retained; and he accordingly wrote to the Company in the following terms: "I hereby reaffirm my resignation tendered to you verbally on the 19th day of May, and repeated by letter June 15. As you seem to have hitherto disregarded this fact, I once more reassert that I definitely severed all connection with the Company on the first-mentioned date. I must further add that if my name is still continued to be used by you in any meeting or publication, I shall take steps to prosecute you for the unwarrantable use of my name." The statutory meeting of the Company was held at the Westminster Palace Hotel on Friday; but it was not announced in the list of meetings in "The Times" and "Financial News," and the representative of the latter newspaper was refused admission.

At the meetings of the Herne Bay and West Surrey Water Companies last Tuesday, a dividend at the rate of 5½ per cent. per annum on the ordinary stock in the case of the former Company, and dividends at the rate of 7 per cent. per annum on the 7 per cent. shares, and at the rate of 8 per cent. per annum on the 10 per cent. shares, in the case of the latter Company, were declared.

SHEFFIELD UNITED GASLIGHT COMPANY.

Half-Yearly Report and Accounts.

At the Meeting of this Company on the 3rd prox., the Directors will report that the consumption of gas in the six months ended the 30th of June showed the satisfactory increase of 96,427,000 cubic feet, or 7·21 per cent., on the quantity sold in the corresponding period of 1905. This is stated to have been due to three causes—the improvement in the general trade of the town, the cold and gloomy weather in the spring, and "the very low price at which gas is now sold, which encourages its use both for business and domestic purposes." The Company's charges from the 1st of April last have been 1s. 5d., 1s. 3d., and 1s. 1d. per 1000 cubic feet, according to consumption; and the average price during the half year was 1s. 4·4d. The accounts accompanying the report show that the revenue was £168,748, made up principally of £97,534 from the sale of gas, £8329 from meter and stove rentals, and £61,923 from the disposal of residual products. The expenditure on the manufacture of gas was £92,436; on distribution, £14,887; and on management, £6183—the total expenses being £124,538. The amount carried to the profit and loss account is £44,210; and the balance of net profit is £128,614. The half-year's profits are sufficient to allow of the payment of the usual dividends and the addition of £1218 to the accumulated balances.

CROYDON COMMERCIAL GAS COMPANY.

Half-Yearly Report and Accounts.

The report which the Directors of the Croydon Gas Company will present to the shareholders at their meeting on Friday opens with the statement that the profit for the six months ended the 30th of June was in excess of that for the corresponding period of 1905, and that this was due to increased revenue from gas and residuals, and to "the improved manufacturing results now being obtained at the works." The sales of gas exceeded those of the Croydon and Caterham Companies in the first half of last year by 7·7 per cent.; and during the period covered by the report, the number of consumers increased by 1294, of stoves on hire by 984, and of public lamps by 23. The accounts accompanying the report show that the total revenue was £101,471, of which £74,108 was derived from the sale of gas, and £20,093 from the disposal of residuals. A sum of £48,663 was expended on manufacture and £15,619 on distribution; rents, rates, and taxes came to £4520; management cost £3673; and the total expenses were £76,710. The balance carried to profit and loss account is £24,761; and the amount available for distribution is £24,381. Out of this, the Directors recommend the payment of dividends at the rates of 14½, 11½, 10¾, 10, and 5 per cent. per annum, all less income-tax, on the various classes of stock. This will absorb £19,853, and leave a balance of £4528. The statements relating to the working show that, under the supervision of Mr. J. W. Helps, the Engineer and General Manager, 36,426 tons of coal, and 438,959 gallons of oil were used during the half year in the manufacture of 574,341,300 cubic feet of gas, of which 536,480,600 cubic feet were sold and 544,058,000 cubic feet accounted for. The estimated quantities of residuals produced were: Coke, 21,859 tons; breeze, 3440 tons; tar, 478,647 gallons; and ammoniacal liquor, 1,028,113 gallons—the make of sulphate being 361 tons.

PROVINCIAL GAS AND WATER COMPANIES.

Gas.

Less Power Gas Burnt at Camborne.

In addressing the shareholders at the annual general meeting of the Camborne Gas Company last Wednesday, the Chairman (Mr. J. M. Holman) said he thought they would agree with him that the accounts were satisfactory, as compared with the previous year. It was true the Company had not sold quite so much gas—the figures being 16,099,400 cubic feet, as compared with 16,281,400 cubic feet, a decrease of 182,000 cubic feet; but the money value was more, being £3231, against £3193. The decreased consumption was accounted for by the falling off in the use of gas for power purposes, owing to depression in foreign markets, causing less demand for goods manufactured in the district. He was pleased, however, to say that now works were in full swing, and a normal quantity of gas was being burnt. The increased money value was due to more gas being used as an illuminant, and this was satisfactory. They had encouraged the use of gas for power, and they had a sliding-scale of prices for this consumption, which he thought would compare favourably—probably it was on a lower basis—than that of any other gas company in the county. There had been carbonized during the year 1762 tons of coal, against 1806 tons in the previous year, a decrease of 44 tons; and the quantity of gas made per ton had been more than the average—a very high one, which showed that their machinery and plant were all in good order. The quality was such that they were not aware of a single complaint. The leakage, he was happy to say, had again been lessened—a result that was very gratifying. Great praise was due to their Manager (Mr. W. Bailey) and staff for the careful attention they had given to this very important matter. They could also congratulate themselves on what was a very pleasing feature—the steady increase in the number of customers who burnt the gas only as an illuminant. He concluded by proposing that the report and accounts be adopted, and that a dividend be paid of 3 per cent., which, with the interim dividend of 2½ per cent., made 5½ per cent. for the year. Mr. Hugh P. Vivian having seconded the motion, the Chairman remarked that Mr. Bailey, who had had close upon 50 years' experience of the gas supply of the district, would be pleased to give any information or answer questions. Mr. Bailey then offered some explanatory remarks on the items in the revenue account, and assured the shareholders that the affairs of the Company had gone on very quietly during the year, and their staff—a most excellent one—was, he might call it, really more a sort of companionship than a staff. It was an absolute fact that throughout the year discipline had been maintained without his having to utter a single harsh word. The works had been kept in good condition, they had had no complaints during the year as to the quality of gas supplied, and he was quite sure no one could complain of the pressure they had kept on. It was satisfactory that even with an increased day pressure required for their cooking consumers, the leakage had been considerably less. The report and accounts were adopted, and the dividend recommended was declared. The thanks of the shareholders were accorded to the Chairman, Manager, and staff; special reference being made to the exceptional services rendered to the Company by Mr. Bailey, who is Secretary as well as Manager.

Record Output of Gas at Chester.

At the ordinary general meeting of the Chester United Gas Company on Monday last week, the Directors, in their report for the half year ending June 30, stated that, after providing for interest on debenture stock and the dividend on the preference stock, there was a balance to the credit of the profit and loss account of £4098, out of which they recommended the declaration of an interim dividend on the ordinary stock at the rate of 2½ per cent. The works and plant were reported to be in a satisfactory condition; and it was stated that there had been an increase of 3,628,350 cubic feet in the quantity of gas supplied during the six months. The Chairman (Mr. John Gamon), in moving the adoption of the report and accounts, remarked that the business of the Company continued to be steady and progressive; there being nothing unusual affecting its prosperity, excepting the continuing low prices of residuals. Fortunately, there were now signs of an improvement in this direction. If the public would give the Company greater support, there might soon be a reduction in the price of gas; but it would all depend upon their support. The output of gas in the past half year had been the largest since the Company was formed. They had paid out of revenue considerable sums for the renewal of the plant, and were carrying forward, after paying the dividend, a larger balance than they had for the last two or three half years. The report was adopted, and the dividend recommended was declared.

Steady Improvement at Leatherhead.

At the recent annual meeting of the Leatherhead Gas Company, the Directors recommended the payment of a further dividend of 6s. per share, making, with the interim dividend, 5 per cent. for the year. The accounts presented showed that during the past year £1723 had been expended on new plant and machinery connected with manufacture, and £1105 on new mains, service-pipes, &c. The Engineer (Mr. F. S. Cripps) reported that the sulphate of ammonia apparatus had been completed, and the working results proved satisfactory. A new boiler and two purifiers had been erected, and about 2150 yards of mains had been laid during the past twelve months to Effingham and other places. A new engine and exhauster, tar-extractor, governors and governor-house, with connections, were in course of erection. The Chairman (Mr. F. Hue Williams), when moving the adoption of the report and accounts, said they were very satisfactory, showing as they did that the Company's business steadily improved, in spite of the competition of other lighting companies. During the year they had made 1,400,000 cubic feet of gas more than they did in 1904, and had sold nearly 2,000,000 cubic feet more. The difference had been accounted for by the saving of nearly 500,000 cubic feet of gas, with which they would have to credit Mr. Cripps and Mr. Hickford (the Manager), as they had been the principal means of finding out leakages, which now were certainly not more than they must have in a large area of mains. Under the advice and able superintendence of Mr. Cripps, they had erected in the sulphate of ammonia apparatus what he hoped would prove to be a money-making addition to their former income. Hitherto they had sold their sulphate for shipment to France and other places; but they had reason to believe that they would have a very good trade in it among farmers in Surrey. The Company would have to pay 1s. a ton more for coal than they did in the past year; but all the roads, he supposed, would have to be tarred in future, and this might increase their revenue in that direction. The report having been adopted, the Chairman thanked Mr. Cripps for the able attention he had always given to the Company's affairs; and a hearty vote of thanks was accorded to the Chairman and Directors for their services.

Further Extensions Contemplated at Maidstone.

A very satisfactory report was presented at the annual meeting of the Maidstone Gas Company last Thursday. It showed a balance of £12,989 in favour of the Company; and the Directors recommended a dividend, less income-tax, at the rate of £7 12s. 6d. per cent. per annum. Referring to the purchase of the undertaking of the Hollingbourne Gas Company, the Directors stated that connecting mains had been laid, and the parish named, and also Leeds, were being supplied; and the income derived showed a satisfactory return upon the capital invested. It was intended to apply for further powers to enable the Company to supply Harrietsham and Lenham; urgent requests having been received from the Parish Councils and leading parishioners of these places. The extension of the mains to Boxley, Boughton Monchelsea, Coxheath, and East Farleigh had been completed; and the results had been satisfactory. The Directors concluded by stating that the business of the Company generally had continued to show a steady increase. The Chairman (Mr. George Marsham), in moving the adoption of the report, laid stress upon this statement, and said that, after allowing for all necessary depreciation, there had been sufficient profit made to pay the maximum dividend under the sliding-scale. The gas consumed showed an increase of 10½ million cubic feet, or 4 per cent., as compared with 3 per cent. in the previous year. The sum received for gas had risen by £1519; and rental of meters, stoves, and fittings by £509. On the other hand, the receipts for residuals had decreased by £391, mainly owing to the lower prices obtained for coke. The ordinary consumers now numbered 3460, and the prepayment consumers 5179; the increases for the year being 158 and 546 respectively. Cooking and heating stoves—always an important item—had gone up

by 488 and 133. There were also increases of 7 in the number of gas-engines, and 19 in the public lamps. Coming to the price of gas, they had been able to maintain the low figure of 2s. 4d. per 1000 cubic feet. There had lately been a considerable advance in the cost of coal; the price paid under the new contract being 1s. 1½d. per ton in advance of last year's. As, however, the profit during the past year had enabled the Directors to write off £1700 for depreciation, they ventured to hope they would continue to supply gas for the current year at the existing low price. As to the work done by the staff, every effort was made to keep the works (which are under the care of Mr. H. J. Smythe) thoroughly up-to-date. The public had been told at the recent meeting of the British Association that they were on the threshold of further improvements in gas; and the shareholders might have every confidence that the staff would take advantage of whatever occurred in this direction. Dr. Hoar seconded the motion, and it was carried; and the dividend recommended was subsequently declared.

Reward for Enterprise at Salisbury.

At the annual meeting of the Salisbury Gas Company last Wednesday, the Chairman (Mr. G. Fullford) in moving the adoption of the report and accounts and the payment of the usual dividends, said the work of the Company during the past year had been satisfactory, and he could again congratulate the proprietors on the state of affairs. New and additional mains and services had been laid in various parts of the enlarged city. These extensions, together with the erection at the works of modern machinery capable of efficiently dealing with a growing consumption of gas for all purposes, had necessitated some expenditure. The sales of gas showed a substantial increase, and the slot-meter system was growing in popularity among the artisan class of the population. The maintenance of incandescent burners by the Company's own men at a small fixed charge had proved most satisfactory. As the Company were among the pioneers both in respect to slot meters and burner maintenance, it was gratifying to find that both these systems were now generally adopted by gas companies throughout the country. Mr. W. Young seconded the motion, which was unanimously carried. A vote of thanks having been accorded to the Chairman, Directors, and staff, for their services during the past year, it was acknowledged by Mr. S. R. Atkins on behalf of the Directors and by Mr. N. H. Humphrys, the Engineer and Manager, for the staff. The latter mentioned that the number of men employed by the Company was about 80; and therefore they could claim a prominent position among employers of labour in the district.

Another Successful Year at Taunton.

The annual general meeting of the Taunton Gas Company was held last Tuesday—Mr. Jonathan Barrett presiding. The Directors in their report stated that the quantity of gas sent out during the twelve months had been 94,263,800 cubic feet; being an increase of 2,992,000 cubic feet on the preceding twelve months. The amount of profit available for distribution was £7626, out of which sum the Directors recommended dividends at the rates of 5, 8, and 7 per cent. on the various classes of stock. These would absorb £3622. The Directors further recommended that the additional dividends of 1 per cent. and ⅞ per cent. respectively, which are payable under the sliding-scale, and amount in all to £449, should be transferred to the reserve fund account. The Chairman, in moving the adoption of the report, referred to the continued progress of the Company's business, and remarked that, though they could produce such excellent dividends, they were at the same time not unmindful of the consumers. Some two or three years ago, they reduced the price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet; and this year they had decided to allow a rebate to the prepayment consumers. The sum thus distributed amounted to £315, and had given great satisfaction. The report was adopted, and the dividends recommended were declared. The Directors having been thanked for their services during the past year, the Chairman, in acknowledgment, spoke highly of the services rendered by Mr. Alfred Edwards, the Secretary and Manager, and said it was his strict attention to details and good business habits which had brought the Company to such a state of prosperity. He proposed a vote of thanks to Mr. Edwards and his staff for their services during the past year; and the proposition was heartily carried. Mr. Edwards, replying, said that after forty years' attendance at the Company's annual meetings, it was very pleasing to find such renewed confidence in himself and his staff.

Water.

Increased Outlay at Barnstaple.

Presiding at the half-yearly meeting of the Barnstaple Water Company last week, Mr. C. E. R. Chanter pointed out that the net water-rental in the six months ended June 30 showed a decrease of £1 as compared with the corresponding period of last year, owing to a larger deduction for voids and allowances. The expenditure was higher by about £200, because of an increase in the outlay on repairs to the reservoir and works generally. This would be greatly to the advantage of the Company, because by it they had been able to reduce the leakage to the extent of several hundred thousand gallons per day; and it was also to the advantage of the consumer, as it increased the quantity of water, and enabled them to extend the time for filtration. In consequence of this outlay on the works, the Directors were of opinion that the balance available for distribution was not sufficient to warrant the payment of any back-dividends. They did not feel justified in paying these unless they absolutely earned the money; but as the expenditure referred to was not a recurring one, they hoped to resume these payments in the next half year. On the advice of the Consulting Engineers, it had been decided to put in a third filter-bed. The statement of accounts was adopted; and it was decided to pay the usual dividends of 10s. and 7s. per share on the "A" and "B" shares respectively.

Bonus for Shareholders at Truro.

The report presented to the shareholders of the Truro Water Company at their recent half-yearly meeting set forth that a new 11-inch rising main had been in use since January last, and had proved a valuable addition to the works. The old 8-inch main had been taken up and relaid as a high-level main, and had been of great advantage. Good progress had been made with the construction of the new filter-beds and reservoir which were commenced in June. The Chairman (Mr. A. C. Willyams), in congratulating the shareholders on the continued progress of the Company, stated that in April tenders were invited for £7840 of 4 per cent. preference stock at par; and the sum of £6610 was taken up—making £11,270 issued. In March, a bonus of £1 per share was paid to shareholders. It was now proposed to distribute a further 10s. per share. As to the new reservoir, when it was completed they would have greatly increased storage. The old one held 366,000 gallons, or about 30 hours' supply. The capacity of the new reservoir would be 540,000 gallons; so that the total storage would be 906,000 gallons, or about three days' supply. The accounts showed that there was a sum of £2503 standing to the credit of the profit and loss account; and it was decided to pay a dividend of 5 per cent. on the ordinary shares, and carry forward the balance of £1993.

DARLINGTON CORPORATION GAS SUPPLY.

The Past Year's Working.

We have received from the Gas Engineer and Manager of the Darlington Corporation (Mr. Frank P. Tarratt) the accounts and statistics of the gas undertaking for the year ended the 31st of March, as prepared by Mr. J. W. Armitage, the Borough Accountant. The sale of 310,732,537 cubic feet of gas for public and private lighting produced a revenue of £32,489; meter and stove rents, £1646; and the disposal of residuals, £11,429—the total receipts being £46,070. The expenditure on the manufacture of gas was £17,105 (coal costing £16,652); stokers' wages came to £5553; distribution cost £2121; rent, rates, and taxes amounted to £2357; management to £1284; and other expenses made a total of £34,219—leaving a balance of £11,851. This sum added to the amount brought forward made £18,925, of which £3440 was transferred to the liquidation of loans account, £3246 was paid for interest, £7000 was transferred to the district fund in aid of the rates, and £5239 was carried to the balance-sheet. The capital invested in the undertaking on the 31st of March last was £181,400, being equal to 11s. 8d. per 1000 cubic feet of gas sold, and the gross profit was equal to 6·53 per cent., and the net profit to 2·84 per cent. upon it. The quantity of coal carbonized was 34,682 tons; and the gas made was 341,640,000 cubic feet, of which 315,415,937 cubic feet were accounted for, or 92·33 per cent. of the make. The revenue from gas was equal to 2s. 1·09d. per 1000 cubic feet sold; but as the net cost was 1s. 3·94d., the gross profit was 9·15d. The net price charged to ordinary consumers is 2s., to large consumers 1s. 10d., and to those on the prepayment system 3s. 1d. per 1000 cubic feet. For power purposes, the price is 1s. 6d.

HALIFAX CORPORATION GAS UNDERTAKING.

The Past Year's Accounts.

We have received the accounts of the Gas Department of the Halifax Corporation for the year ended the 31st of March last. They show that the total revenue was £112,068, compared with £116,958 for the year 1904-5; while the expenditure was £70,702, against £76,423—leaving a gross profit of £41,366, compared with £40,535. The sale of gas to ordinary and prepayment consumers produced £84,229; while gas used for street lighting figures for £7069, and for public purposes for £1074—making a total of £92,372. But against this there was a sum of £215 paid to the Sowerby Bridge Urban District Council for gas supplied to Luddenden, and another of £8567 for discount, &c.; bringing it down to £83,590. Meter-rents came to £2147; and residuals yielded £25,197. Various other items brought up the total to the amount stated above. On the expenditure side, the manufacture of gas (coal and water) came to £40,395; purification to £364; maintenance to £8885; distribution to £6530; management, &c., to £5035; rates to £6117; and £1307 is entered as "loss on tar-works." The balance of £41,366 brought from the revenue account, with a sum of £718 on the highways account, is thus disposed of: Interest, £18,639; sinking funds, £7821; income and property tax, £1021; carried to the appropriation account, £14,553. The last-named amount added to the balance of £14,085 brought forward made a total of £28,638, out of which £6151 is transferred to the borough fund and £3076 to the district fund in relief of the rates, £4802 is put down for the reconstruction of the coal-stores, and £3000 is written off the capital invested in the tar-works; making altogether £17,029, and leaving an unappropriated balance of £11,609.

Following the financial details is an analysis of the cost of gas for the years ended March 31, 1905 and 1906. The net cost of coal last year came to 1·77d. per 1000 cubic feet of gas sold, against 2·04d. before; and the total cost at the works to 14·71d., compared with 15·37d. The net cost outside the works was 5·63d., against 5·31d.; the total cost, 20·34d., against 20 68d. Adding 0·08d. for the accident insurance fund and 0·39d. for the deficiency on the tar works, brought the 20·34d. up to 20·81d., leaving 4·38d. as the balance of profit. At the end of March, 1905, the total cost, as already stated, was 20·68d.; the accident insurance fund came to 0·08d., the deficiency on the tar-works to 0·91d.; the profit to 4·18d. and the total receipts to 25·85d. The gas sent out in the twelve months covered by the accounts was 874,251,000 cubic feet, of which 797,441,800 cubic feet were sold and 10,304,700 cubic feet used on the works. In the year 1904-5, the figures were: Gas sent out, 894,836,000 feet; gas sold, 808,351,800 feet, gas used on the works, 10,791,000 feet.

The Seaford Gas Company, Limited, has been registered with a capital of £54,000, in £10 shares, with the object named in the title. There will be no initial public issue.

WARRINGTON CORPORATION GAS SUPPLY.

A Record Profit.

The annual report of the Gas Engineer of the Warrington Corporation (Mr. W. S. Haddock) came before the Town Council on the 10th inst. He stated therein that the balance showed a net profit of more than £14,000, which was a record. The returns from the sale of gas were much better than in the previous year, and showed an increased income of upwards of £2300. The sales of gas were nearly 5½ million cubic feet more through slot meters, and 10½ millions by ordinary meters. The gas liquor was sold at a good market price, based on the selling price of sulphate of ammonia. The revenue from ammonia was £1300 up, due to the higher price of the salt and improved results from the plant. The profit from coke was about £850 less than before, owing to the fall in prices. The gasholders showed signs of requiring re-sheeting in the near future; and it would be advisable to establish a renewal fund, or otherwise the Council might have to face several poor years. As the profits for the year were better than it was estimated they would be, it would be a favourable opportunity to set aside a sum to meet extraordinary expenses incurred in the renewal of plant. The increased make of gas was 16,279,000 cubic feet, or 4·1 per cent. upon the previous year's production.

Mr. Clegg thought the time had arrived when there should be a reduction in the price of gas; and he drew attention to the fact that the figures given for last year for comparison with this year's did not agree with those of last year. On the suggestion of the Mayor, the report was referred back, in order that the figures might be again gone into.

ROTHERHAM CORPORATION GAS SUPPLY.

Working Statement for the Past Year.

According to the statement of the income and expenditure of the Rotherham Corporation gas undertaking per 1000 cubic feet of gas sold and per ton of coal carbonized, which has been prepared by the Engineer and General Manager (Mr. J. S. Naylor), the revenue from gas and public lighting in the twelve months ending the 31st of March last amounted to £35,720, compared with £34,893 in the preceding twelve months; while the net cost of gas was £18,261, against £19,359. The gross profit was £17,459 last year and £15,533 in 1904-5; the net profit being £7681 and £5629 respectively. Deducting the cost of gas used for public lighting, these amounts are brought down to £5717 and £3091—being the surplus profits. The net cost of gas works out to 15s. 4·63d. per ton of coal carbonized, and 1s. 5·94d. per 1000 cubic feet of gas sold. The revenue being 30s. 1·16d. and 2s. 11·10d., the gross profit is 14s. 8·53d. and 1s. 5·16d. The net profit is 6s. 5·67d. and 7·55d.; while the surplus works out to 4s. 9·8d. and 5·62d. respectively. The quantity of coal carbonized was 23,737 tons, and the gas made was 279,996,000 cubic feet, or 11,796 cubic feet per ton. Of the total make, 244,242,800 cubic feet were sold, or 87·24 per cent.; and 32,389,300 cubic feet, or 11·56 per cent., were unaccounted for.

OXIDE v. LIME FOR PURIFICATION.

Experiences at Driffield.

At the last meeting of the Driffield Urban District Council, the minutes presented by the Gas Committee contained a resolution instructing the Manager (Mr. E. W. Wright) to resume the purification of gas by oxide of iron after the 24th ult. In answer to a question, Mr. Johnson said the Committee had used lime for two months in the purifiers, and had found it very costly. The lime was used as a "cure" for a certain complaint made by a tradesman as to the damage caused by the oxide to his metal goods. But he thought the cure was worse than the disease; and therefore they had reverted to oxide of iron. Mr. Shepherdson (the ex-Chairman of the Gas Committee) said he was very glad lime had been discarded. He considered it was a mistake to resume the use of this material after the benefits of oxide of iron had been tested. Alderman Bradshaw wished to know whether the Committee were satisfied as to the cause of the damage alleged to have been sustained by the tradesman mentioned, as he considered a risk was being incurred if they were not. The Chairman said the tradesman, on the resumption of lime purification, complained bitterly to him of the objectionable effluvia from it, and said it made two of his workmen ill. He added that the Council had never admitted that the use of oxide of iron caused damage to the tradesman's goods.

Thornaby-on-Tees Water Supply.—At a meeting of the Thornaby Town Council last Tuesday—the Mayor (Alderman H. Taylor) presiding—Alderman Anderson moved a resolution authorizing the Water Board to promote a Bill or Bills in Parliament for consolidating the present Acts and obtaining further powers. They had at present, he said, eight Acts and three Provisional Orders, and the object was to have only one Act to refer to. They were very nearly approaching the limits of their powers, as they were supplying 104 million gallons of water per week out of 106½ millions. They hoped by the Bill to get authority for a satisfactory increase. When the Grassholm reservoir was completed, they would have 80 million gallons more to dispose of, and then they would fall back to 60 millions taken from the River Tees. They hoped before long the water undertaking would be a paying concern, without any encroachment upon the rates, and that something would be left for the ratepayers, together with a reduction in the price of water. They had the power to make a substantial reserve fund, and whatever reduction took place after this fund was established would be equally divided among the whole of the consumers. The motion was unanimously carried.

NEW WATER SUPPLY FOR CARLISLE.

Turning on the Geltsdale Water.

Last Thursday, the Chairman of the Geltsdale Water Committee of the Carlisle Corporation (Sir Benjamin Scott) had the gratification of performing the final act in connection with the provision of a new water supply for the city, by turning on the water which, after much difficulty, has been obtained from Geltsdale. The ceremony took place in the presence of the Mayor (Mr. W. I. R. Crowder, jun., M.A.), the members of the Corporation, and the principal citizens—representing practically all the trades and professions in the city. The company went by motor-car and carriage from Carlisle to the little village of Castlecarrock, which was gaily decorated for the occasion; a fine display of bunting being made on the ground near the filter-beds, where the party assembled. The Mayor, in inviting Sir Benjamin Scott to turn on the water, expressed the hope that it would have most beneficial results to the citizens for many generations to come. Sir Benjamin then turned a large key, and allowed the water to run through the mains; and in a very short time it reached Carlisle. He afterwards set turbines in motion for the supply of water to Brampton. As mementoes of the occasion, he was presented with a silver rose-bowl by Mr. E. L. Mansergh, on behalf of the Engineers, and with a goblet by Mr. Kennedy, on behalf of the Contractors who have completed the first portion of the work. In the evening, a banquet was given by Sir Benjamin Scott, at the County Hotel, to celebrate the event.

Though the water is gathered in Geltsdale, in the midst of the hills, at a distance of fully three miles from Castlecarrock, the principal works are on the Castlecarrock side of the fells, and quite close to the village. Immediately above it, on the right of the road, a narrow, shallow valley winds towards the hill. Close to the road, the turf has to a great extent been removed—a portion of this uncovered soil revealing a group of seven filter-beds, arranged in such a manner that, with two others, which it will be possible at any time to add, they would form a square having an area of 6000 yards. Near the filter-beds there is a small building in which are the turbines used in connection with Brampton's share of the water. A steep flight of steps alongside this building leads up the hill to an elevation 90 feet above the filters, where a tank has been constructed. The water gathered in Geltsdale flows through a 20-inch main either to this tank or to the filters direct. When the reservoir is completed, the water will be conveyed to the upper end by a pipe from the tank on this elevated ground. In its descent, the water acts upon the turbines, which pump it to the Brampton reservoir at Garth Head, and fill a tank for the farms in the neighbourhood. The higher portion of the valley will eventually be converted into a miniature lake, holding 170 million gallons. Near the filter-beds, an embankment, 40 feet high at the middle part, will stretch across the valley from one slope to the other, and so retain the water. When the embankment is completed, the water will accumulate in the great reservoir, and flow from it to the filter-beds and thence to an underground tank alongside them. The top water-level here is 474 feet above Ordnance datum. Six miles of 6-inch main connect this tank with the service reservoir at Cumwhinton. This reservoir has a capacity of 5 million gallons, and the top water-level is 275 feet above Ordnance datum, or 150 feet higher than the reservoir at Harraby Hill, from which the city has hitherto been supplied. A length of 4½ miles of 21-inch main joins up the city mains with the reservoir at Cumwhinton.

The Geltsdale water scheme, as many of our readers are aware, has had a chequered history since it was submitted to the Town Council in 1897 as being more desirable than an extension of the existing pumping machinery. The original estimate of the cost by Mr. Newton, who was then Engineer, was £130,000. Mr. E. M. Eaton, who reported upon the scheme, estimated £120,000; while a strong argument in its favour was that in the course of a few years it would pay for itself. The scheme was adopted, and an Act was obtained in 1898 empowering the Corporation to spend £150,000. When the tenders were received for the first portion of the work, which did not include the reservoir, trouble began. The highest tender was roughly £142,000, and the lowest £113,000. The confidence of the Council in the Engineers was shaken, and after some stormy scenes, the services of both of them were dispensed with in July, 1901. The following May Messrs. James Mansergh and Sons were called in to advise the Council; and their report was submitted in December. Consternation and indignation were the prevailing feelings when it became known that the city was committed to a scheme which, according to Messrs. Mansergh's estimate, would cost £243,000. Mr. Balfour Browne, K.C., who was consulted as to the advisability of abandoning the Act of 1898, advised the Council to proceed with the scheme. A meeting of the citizens, after an acrimonious discussion, passed a resolution against any steps being taken involving further expense; and when the matter again came before the Council, it was agreed by a majority of only two to proceed with the scheme. In July, 1903, Messrs. Mansergh and Sons were appointed Engineers; and the work had since proceeded under their direction, though in the meantime Mr. James Mansergh, the head of the firm, died, and Mr. E. L. Mansergh became the senior partner. Owing to the extra cost of the works, the Council have this year found it necessary to obtain borrowing powers for an additional £100,000—in this way increasing their borrowing powers to £250,000.

The tender for contract No. 1, which has been completed by Messrs. Kennedy, of Partick, amounted to £120,088; that of Messrs. Arnold and Sons, of Leeds and Doncaster, for the construction of the reservoir, &c., came to £61,733, and this part of the work will not be completed for probably two years. The two tenders amount to a total of £181,821. In addition to this, nearly £21,000 has to be put down for lands and easements and legal expenses connected therewith; and a further amount will be absorbed in the settlement of the claim of Lord Carlisle, in respect of which the award of £18,000 has not yet been accepted as final by the Corporation. The legal costs in connection with Lord Carlisle's claim amount to £1876; and parliamentary expenses, Engineers' remuneration, &c., will go to swell the total.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Two months ago, the question arose in the Paisley Town Council whether Bailies Caldwell and Dougall had acted illegally in purchasing coke from the Corporation gas-works, to be sold by them again in the course of their business. It first came before the Town Council in June, when a scene arose between Mr. R. D. Brown and Bailie Caldwell, in the course of which an accusation was thrown out that there had been an illegality. The Town Clerk, having looked into the matter, gave his opinion that the practice was illegal. It was then resolved to take the opinion of the Lord Advocate—Mr. T. Shaw, K.C.—on the subject. He has sent in his opinion; and it is announced that it is to the same effect as that of the Town Clerk. When the Council resolved to obtain the opinion of the Lord Advocate, they also agreed that they would be guided by it. The chief sequence to an illegal act on the part of a councillor is disqualification.

In the Johnstone Town Council on Monday, it was reported that the capital of the gas undertaking at the beginning of the last financial year was £27,299, that during the year £412 was added to the capital, and £1355 was applied from the sinking fund to reduction of capital, which now stands at £26,356. The gas undertaking still continues to prosper; and notwithstanding that reductions amounting to 9½d. per 1000 cubic feet had been made during the past three years, the Committee considered that they were still able to continue the low charge of 2s. 4d. per 1000 cubic feet, and that at the close of the current year there would be a balance on the right side. The balance at the end of last year was £37, and with this sum the balance at the credit of the revenue account now amounted to £910. In the Gas Committee, Mr. Cameron raised the question of the charging of a lower price for gas used for motive power. The matter was referred to the Clerk, who gave it as his opinion that the Burghs Gas Supply (Scotland) Act, 1876, did not provide for them so doing. Mr. Cameron, in the Council, moved that the charge for gas used for power purposes be 2s. 2d. per 1000 cubic feet, Mr. Armour, the Convener of the Gas Committee, said he would rather see meter hires (1s. per year) abolished, or discount given to large consumers, than a differential rate. The granting of a differential rate was agreed to by six votes to five. The price of gas is therefore now 2s. 4d. to ordinary consumers, and 2s. 2d. for power purposes.

It is announced that the Finance Committee of the Greenock Corporation have brought out a surplus on the gas undertaking of £3500; and that, on the motion of Provost Denholm, it has been agreed to apply £2000 of this towards the reduction of municipal taxation.

In the Forfar Town Council on Wednesday, Mr. M'Dougall, the Convener of the Gas Committee, moved that the price of gas be reduced from 3s. 4d. to 3s. 2d. per 1000 cubic feet to ordinary consumers, and to 3s. 1d. for that used in gas-engines. They estimated a revenue of £5114, and a surplus of £299. The motion was adopted.

The new gas-works of the Peebles Town Council had been ten months in operation when the financial year closed, and they had come to within about £80 of the paying-point. If they had been working for the full twelve months, they would have more than paid; so that they might expect that at the end of the year they would have a surplus in hand. The Council at their meeting this week agreed that the price of gas remain as formerly—viz., 3s. 4d. per 1000 cubic feet for ordinary purposes, and 2s. 11d. for power.

The Gas Committee of the Port Glasgow Town Council have resolved, on account of satisfactory financial results, to reduce the price of gas from 3s. 6d. to 3s. 4d. per 1000 cubic feet.

The Monifieth gas undertaking has been very successfully worked by the Corporation since they took it over last year. To the end of the financial year was a period of 7½ months after the transfer; and the profit earned has amounted to £370. This, considering that the Commissioners reduced the price of gas by 1s. per 1000 cubic feet, is an altogether satisfactory result, and one which reflects great credit on the management.

The Corporation of Glasgow on Thursday agreed to a proposal of the Water Committee to acquire the undertaking of the Busby Water Company. The Company were, it was reported, willing to sell at the price of £30,414 (stores to be taken over at a valuation), and the Company, out of the purchase price, to pay off all loans and debts due by them, and to retain and uplift all sums in hand or due to them. The price is based on a thirty years' purchase of the average net revenue of the Company. The Corporation are to obtain the sole right to supply water in the area served by the Company. The agreement is subject to the obtaining of statutory powers, as to which there may be opposition from the County Council of Renfrew, who are proposing to apply for a Provisional Order empowering them to provide water for a portion of the area at present supplied by the Busby Company, including the village of Giffnock.

Presiding at Leeds, last Tuesday, at the meeting of Messrs. Henry Briggs, Son, and Co., of the Whitwood Collieries in Yorkshire, Mr. Currer Briggs said that in the coal trade there had been an improvement in the demand, which set in last November, and which was attributable almost entirely to the demand for coal from abroad. A year ago in the Northumberland and Durham districts the prices of coal were so low that it was impossible for Yorkshire collieries to compete with them, except by giving away a considerable sum with every ton sent abroad. It seemed that they should rather restrict their output than indulge in competition. This year the demand had outstripped what Northumberland and Durham were doing. The collieries were enabled to be better employed and to pay a considerable increase in the aggregate of wages to their men in the locality.

CARBURETTED WATER-GAS APPARATUS

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Blackburn	1,250,000	Winnipeg, Man.	500,000	Malton	150,000
Windsor St. Works, Birmingham	2,000,000	Colchester (Second Contract)	300,000	Smethwick	500,000
Saltley Works, Birmingham	2,000,000	York	750,000	Gravesend	300,000
Colchester	300,000	Rochester	500,000	Pernambuco, Brazil	125,000
Birkenhead	2,250,000	Kingston, Ont.	300,000	Duluth, (Second Contract)	300,000
Devizes	120,000	Crystal Palace District	2,000,000	Leicester (Second Contract)	1,000,000
Saltley, Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Newport (Second Contract)	250,000
Windsor St., Birmingham (Second Contract)	2,000,000	Caterham	150,000	Brockville	250,000
Halifax	1,000,000	Leicester	2,000,000	Toronto (Third Contract)	750,000
Toronto	250,000	Enschede, Holland	150,000	Montreal, Ont. (Second Con.)	1,800,000
Ottawa	250,000	Buenos Ayres (River Plate Co.)	700,000	Toronto (Fourth Contract)	1,000,000
Lindsay (Remodelled)	125,000	Burnley	1,500,000	Hamilton, Ont.	400,000
Montreal	500,000	Kingston-on-Thames	1,750,000	Rochester (Third Contract)	1,600,000
Toronto (2nd Cont., Remodelled)	2,000,000	Accrington	500,000	Leeds (Second Contract)	900,000
Belleville	250,000	Tonbridge	300,000	Buenos Ayres (Primitiva Co.)	1,200,000
Ottawa (Second Contract)	250,000	Stretford	500,000	Buenos Ayres (New Co.)	1,200,000
Brantford (Remodelled)	200,000	Oldbury	300,000	Christchurch, N.Z.	300,000
St. Catherines (Remodelled)	250,000	Todmorden	500,000	Rochdale	1,600,000
Kingston, Pa.	125,000	Saltley, Birmingham (Third Contract)	2,000,000	St. John's, Newfoundland	250,000
Peterborough, Ont.	250,000	York (Second Contract)	750,000	Brantford (Second Contract)	400,000
Wilkesbarre, Pa.	750,000	Rochester (Second Contract)	500,000	Smethwick (Second Contract)	500,000
St. Catherines (Second Cont.)	250,000	Newport (Mon.)	250,000	Pontypridd	250,000
Buffalo, N.Y.	2,000,000	Tokio, Japan	1,000,000	Montreal (Third Contract)	1,800,000
		Newcastle-on-Tyne	1,800,000	Guelph, Ont.	350,000
		Leeds	1,800,000	Buenos Ayres (River Plate Co.) Second Contract	750,000
				Belgrano (River Plate Co.)	500,000

And, in addition, COAL GAS PLANTS at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

CURRENT SALES OF GAS PRODUCTS.

Week ending Aug. 18.

The London market for tar products remains in about the same condition. There is no change in pitch, for which a good deal of inquiry continues. There is a strong demand for solvent; but very little is offering. Sulphate of ammonia is quiet; the quotation remaining the same.

Sulphate of Ammonia. LIVERPOOL, *Aug.* 18.

There has been a steady demand all through the week, and towards the close a further improvement in values, the closing quotations being £11 17s. 6d. per ton f.o.b. Hull, and £12 per ton f.o.b. Liverpool and Leith; and it may be noted that direct buyers have had a larger share in the business. Inquiry in the forward position has been sustained, but comparatively little business has transpired; direct buyers still jibbing at the premium required for delivery ahead, and speculators not seeing their way to paying the latest advance asked. £12 2s. 6d. per ton for delivery up to the end of the year, £12 5s. for October, 1906-March, 1907, and £12 7s. 6d. for January-April are probably the nearest selling values.

Nitrate of Soda.

This article is firm, and spot prices are 11s. 3d. to 11s. 6d. per cwt., according to quality.

Tar Products. LONDON, *Aug.* 20.

There has not been much change in the market for tar products during the past week. Prices all round have been firmer. The market for pitch appears to be very firm indeed for forward delivery, and manufacturers in all cases quote very high prices; but it is not certain that these are being paid at present. Continental buyers are still disinclined to do any business. There has evidently been some uncertainty as regards supplies of coal; and also they appear to hold the opinion that prices will be easier a little later on. The South Wales buyers are well covered to the end of the year; and though open for January-June, it is not possible to put prices before them owing to manufacturers being unwilling to quote. For creosote, London makers are still asking high prices; but second-hand oil has been offered at 1⅞d. per gallon, usual terms and conditions. In the Midlands and the North, manufacturers appear to be well sold, and are not inclined for business except at good price. At makers' works in the North, 1½d. has been paid; but in most cases higher figures than these are asked. But any orders which may come into the market are much sought after by dealers, who evidently have oil for disposal. There is no change in the value of anthracene. Further business has been done in 40 per cent., at 1½d. per unit. The demand for solvent naphtha is very good indeed, especially for London qualities for prompt delivery, for which high prices are reported to have been paid; while a contract of some importance was placed for delivery to the end of the year at 1s. 3d. There is no change in the position of carbolic acid. Continental consumers refuse to advance their price above 1s. 9d., but cannot secure suppliers at this figure; any parcels which offer being readily taken up at over this. There does not appear to be any change whatever in crystals. In toluol, business is reported to have been done on the east coast at 1s. 1d. per gallon to the end of the year; while the London manufacturers in most cases ask 1s. 2d. for any small quantities which they have for delivery. The market for benzol appears to be rather firmer. Business is reported to have been done in London at equal to 9¾d.; and there is evidently not much offering in 50-90 per cent. No business is reported; and prices remain unchanged.

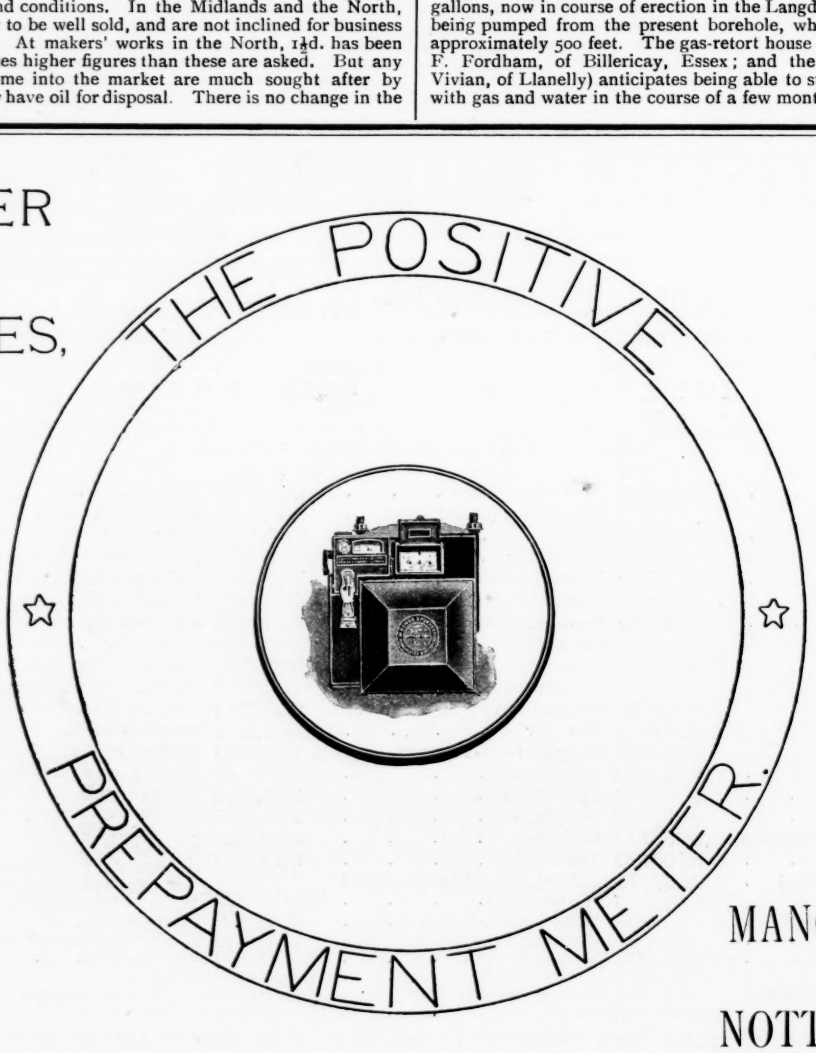
The average values during the week were: Tar, 15s. to 19s. Pitch, London, 27s. 6d. to 28s.; east coast, 26s. 6d. to 27s. 6d.; west coast, 25s. 6d. to 26s. 6d. Benzol, 90 per cent., 9½d. to 9⅝d.; 50-90 per cent., 10⅜d. to 11d. Toluol, 1s. 1⅛d. to 1s. 2d. Crude naphtha, 4d. to 4¼d.; solvent naphtha, 1s. 1d. to 1s. 2⅛d.; heavy naphtha, 11⅛d. to 1s. 1d. Creosote, London, 1⅞d. to 2d.; North, 1⅛d. to 1⅝d. Heavy oils, 2⅛d. Carbolic acid, 60 per cent., 1s. 9d. to 1s. 9⅝d. Naphthalene, £4 10s. to £9 10s.; salts, 26s. to 27s. 6d. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

The market for this article remains firm, but values are very little changed. The big London Companies are practically out of the market for prompt delivery; but there are sellers at about £12 upon Beckton terms. In Hull, no business of importance has been done for some little time past; but it is reported that £12 has been paid for good make for August delivery. In Leith, there is no quantity offering for immediate delivery; while for September, makers' ideas are £12 2s. 6d. In Liverpool, business has been done in discoloured parcels at from £11 16s. 3d. to £11 17s. 6d.; while for good grey manufacturers ask £12.

Gas and Water for Laindon and Langdon Hills.—We learn that favourable progress is being made to supply gas and water to the above districts. Already more than two miles of mains have been completed up to the new service reservoir, of the capacity of 100,000 gallons, now in course of erection in the Langdon Hills. The water is being pumped from the present borehole, which reaches a depth of approximately 500 feet. The gas-retort house is being erected by Mr. F. Fordham, of Billericay, Essex; and the Engineer (Mr. Frank Vivian, of Llanelly) anticipates being able to supply the whole district with gas and water in the course of a few months.

SAWER AND PURVES,



MANCHESTER AND NOTTINGHAM.

COAL TRADE REPORTS.

Lancashire Coal Trade.

There has been no movement lately on the part of the operative colliers of this district to accentuate their desire for an increase in the rate of wages; but after what has transpired in the North, coupled with the decision of Lord St. Aldwyne at Cardiff last Saturday at the meeting of the South Wales Conciliation Board, to grant the men an increase of 5 per cent., we may soon hear of a claim from the miners of the Lancashire district. More gas coal and cannel are now being required to meet the increased demand. Quotations on the Manchester Coal Exchange show no alteration from last week. Furnace coke varies from 17s. to 24s.

Northern Coal Trade.

The briskness in the coal trade of the North continues undiminished; and, with a growing home consumption as the days shorten and a very full export, there is a strong demand that takes up the whole of the production. This enables the chief collieries to book orders ahead, and thus to keep the prices very firm. In steam coals, best Northumbrians are now quoted at 11s. per ton f.o.b., second-class steams from 10s. to 10s. 3d., and steam smalls are firm at 6s. to 6s. 6d.—the latter kind being still rather scarce, with prices tending upwards where early delivery is needed. In the gas coal trade, there is now a more steady increase of the home consumption; and while it is evident that some orders have gone to other districts, in consequence of the relatively lower prices taken, there is now a very full demand for Durham gas coals, so that the best qualities have the production taken up for some time. Prices quoted vary from 9s. 9d. to 11s. 3d. per ton f.o.b. for occasional cargoes. One or two small contracts are in the market for export; but they are not heavy enough to do much more than define the fact that there is some advance in the general prices since the large contracts were settled. The very best gas coal seems to command very high prices. Coke is firmer; but gas coke only shows the change of some increase in the extent of the output—the price for export remaining at from 10s. 3d. to 10s. 9d. per ton f.o.b.

Scotch Coal Trade.

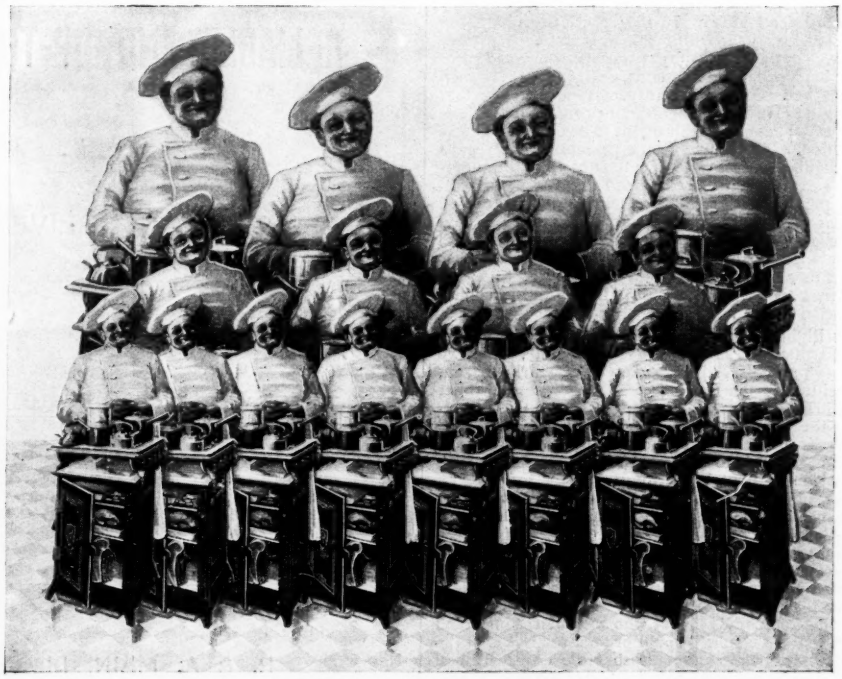
There is a firmer tone reported in the coal market, with prices improving. For ell and splint considerable advances are asked for forward delivery. Coal for trading purposes is also in better request. The prices quoted are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 9d. to 10s, and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 320,845 tons—an increase of 46,620 tons upon the previous week, and of 40,208 tons upon the same week of last year. For the year to date, the total shipments have been 8,240,875 tons—an increase of 929,383 tons upon the corresponding period of 1905.

Price of Gas for Motive Power at Bridgnorth.

At the quarterly meeting of the Bridgnorth Town Council last Tuesday, the Gas Committee reminded the Council that the report of the Committee on the question of a reduction in the price of gas for motive power, so as to compete with suction gas, was referred back to them for further consideration, with a view to arranging for a guarantee that the consumers for motive power would take gas at the reduction suggested for a fixed period. The report was accordingly further considered; and the Committee now informed the Council that a motion to ask the applicants to give a guarantee for two years was defeated by three votes to two. Alderman Whitefoot moved the adoption of the report. He said, as Chairman of the Committee, he regretted that they could not agree to the suggestion to carry out the recommendation of the Council to ask for a guarantee from users of gas for motive power. He had been accused of being personally interested in the proposed reduction in the price of gas; and when he intimated that the Lift Company would, unless they could get a reasonable reduction in the price of ordinary gas, resort to suction gas, it had been insinuated that it was "bluff." He felt these personal allusions; and he might tell the Council that, so far as the Company were concerned, but for him they would have proceeded to put in the suction-gas plant without any effort to get a reduction. This plant was now being laid down, and the Corporation had lost their largest consumer. Mr. Sarjeant contended that the Committee did right in not reducing the price. Alderman Morrall said he knew that a 40-horse power engine was being erected, and the gentleman would have taken town gas if he could have got it at a reduction. He, however, saw how the large consumer was to be treated, and he decided on suction gas. Alderman Whitefoot remarked that at works like theirs the standing charges were comparatively high, and they were going on in the daytime in the summer, and they could double their make of gas then without increasing the expenses. The gas made in the daytime for motive power could be produced at the cost of the coal. The report was adopted.

Calcutta Water Supply.—According to recent reports, it is proposed to increase the Calcutta water supply to 32 million gallons per day; this quantity being part of an ultimate daily supply of 40 million gallons. The Chief Engineer estimates that the net capital expenditure would be 38¾ lakhs of rupees, with a net increase of annual expenditure of Rs. 39,606.

Theft of a Gas-Meter.—At the Greenwich Police Court, on the 11th inst., Richard Starkey (18), of 10, Shipman Road, Forest Hill, and George Knevett (17), living in the same road, were charged, on remand, with stealing, on the 25th ult., from an unoccupied house, a gas-meter, valued at £1 9s., the property of the South Suburban Gas Company. Prisoners both pleaded "Guilty." Starkey, it was proved, had been previously convicted, and he was sent to prison for two months; Knevett being committed for one month.



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Public Lighting in the Lanchester District.

At the monthly meeting of the Lanchester Rural District Council last Thursday, a letter was read from Messrs. S. A. Sadler and Co., of the Malton Colliery, with reference to the question of supplying the public lamps in the Lanchester district with gas from the colliery. They wished to have the sanction of the Council to the proposal, and also permission to lay the mains along the roads, in accordance with their offer of some months ago. If the matter was arranged promptly, they said they might get the gas laid on before the ensuing winter. The offer referred to was that the Council should empower Messrs. Sadler to supply the district with gas for a period of 21 years, to recoup them for the initial outlay; the Council to have the option, on twelve months' notice, to take over the mains, holders, and purifiers at a valuation, the Council to undertake that no other firm or company should be allowed to supply gas, electricity, or any other light, during the currency of the agreement. The price of gas to private consumers would be 3s. 6d. per 1000 cubic feet, and to the Lanchester Council 50s. per lamp per annum net for each street lamp—the Company to clean, light, and extinguish the lamps, which were to burn not more than 1100 hours. If the Council lighted and extinguished the lamps, the price would be 3s. 6d. per 1000 cubic feet. The Clerk (Mr. Ritson) said he had replied to the letter, pointing out that the term was rather too long, and that the Council could not give an undertaking prohibiting any other firm from coming into the district with some other illuminant. The Highways and Lighting Committee recommended that Messrs. Sadler be informed that the price mentioned was considerably more than the Council were paying in other parts of the district for either gas or oil; but that if they would reduce their charge to 30s. per annum for the lighting season of 1100 hours, with a proportionate increase or decrease for the time actually lighted, the Council would be prepared to enter into an agreement to accept the gas for the next five years. The Council would also be willing to light, extinguish, and clean the lamps at 3s. per 1000 cubic feet. The Committee's recommendation was agreed to.

Serious Explosions in Manchester.—Considerable damage was done to business premises in Victoria Street, Manchester, and injury caused to several persons, by two explosions which occurred shortly after four o'clock last Thursday afternoon. Investigation by the employees of the Electricity Department led to the conclusion that the immediate cause of the trouble was the fusing of electric wires at their junction with the cables under the footway, and the firing of an explosive mixture of volatilized bitumen and air which had accumulated in the vicinity. It is thought that the fusion took place 15 minutes before the explosion occurred.

Effect of Gas on Vegetation.—A singular occurrence is reported in Exeter. The gardeners in charge of Northernhay, the chief pleasure-ground of the city, have noticed this summer that while the trees and shrubs generally have been exceptionally healthy and luxuriant, one part of the ground has shown blight and decay. It puzzled the staff, who were unable for a time to discover the cause of this unwonted appearance. At length they traced it to a leaky gas-pipe. From the pipe, which supplies the houses of the lodgekeepers and others, gas had for some time been escaping and poisoning the roots all around. As soon as the discovery was made, steps were taken to repair the pipe.

Exeter Water-Works Extensions.—A Local Government Board inquiry has lately been held in respect of an application by the Corporation of Exeter for sanction to borrow £12,000—£5000 for extension of the water-mains, and £7000 for covering the reservoir at Dane's Castle and the one at Marypole Head. In 1894, authority was given to borrow £4500 for extensions—£2967 in respect of past expenditure, and £1533 for prospective outlay. The £1533 was spent prior to 1900. Since then, £3700 had been expended on mains, and £1300 was asked for in respect of future extensions. The Inspector pointed out that the Board were prepared to give their sanction for probable extensions over a future period of three years, but this ought to be obtained before the money was expended. The Town Clerk promised that regard should be had to this regulation in future. On the question of the proposed covering of the reservoirs, it was explained that it was contemplated to carry out the project with ferro-concrete. The Inspector said the Board would not grant a loan for carrying out the work on this plan for a longer period than 15 years, as they did not consider the material proposed was so durable as masonry. After some discussion, it was determined that further details of plans should be furnished after the Council had reconsidered the subject in the light of the Inspector's intimation as to the period of loan.

A Gas Company's Rights over a Beach.—When the Ilfracombe Gas Company removed their works from the town to Hele, some two or three miles away, they purchased with the site a neighbouring beach, with the object of facilitating the landing of coal cargoes and other material for the works. Last week the Ilfracombe District Council received complaints that the public use of the beach had been curtailed. Several visitors wrote that they had been compelled to pay for bathing there; and a resident at Hele, who had supplied picnic parties with refreshments on the beach without let or hindrance for forty years, complained that a person who rented a house and part of the beach from the Gas Company had forbidden him to do so. Mr. R. Lake, the Chairman of the Company, said that if the person who made the complaints had applied to the Company, he would have been allowed to put up tents; but he refused to do so. The Company had bought all the former owner's rights in the shore; but they had no intention of preventing anyone going there within reason. Mr. W. Pile said it appeared that it was the Company's tenant who was interfering; and he should be informed that the Council would protect the rights of the public if he persisted. Mr. Lake contended that the Company had the power to prevent people putting up tents. The Clerk said that unless they had a lease from the Commissioner of Woods and Forests, the public could not be excluded, and could picnic or bathe when and where they pleased; but he could not say they had a right to put up tents. It was decided to give notice to the person of whom complaint had been made, that he must cease from molesting people.

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New Filter-Beds for Paris Suburbs.

New filtering plant has recently been constructed to deal with the water supplying eight of the Paris suburbs, having a total population of 160,000. It is calculated for some 7¾ million gallons daily, or about 48 gallons per head per day. On leaving the high-pressure main, the water flows through a series of settling-tanks, and aëration cascades, and does not reach the sand filters until after preliminary treatment. There are four settling-tanks, each divided into four compartments of equal size, to facilitate cleansing and repairs. They are filled with gravel, and in them the water is freed from the coarser substances. The preliminary filters following them are merely half-fine sand filters, through which the water passes at a speed six or seven times greater than that which is generally adopted. On leaving the last preliminary filter, the water flows over a cascade to the regular sand filters. These have a working surface in all of about 130,000 square feet, and are divided into 18 compartments. The rate of filtration does not exceed 10 feet per diem. The sides of the basins are coated with a granular material to prevent the water passing (without filtration) between the walls and the sand, which is from the Seine, and screened through a fine mesh. The floor is formed of special perforated bricks, so that all parts can work with the same speed. Two only of the filters are covered. The flow of water is regulated by an automatic governor, consisting of a syphon supported by a float, so that the difference between the levels of water above and below the syphon, and consequently the pressure and flow, remains constant. The effluent from each filter is analyzed daily in the works laboratory, and weekly by the departmental officials. The mortality due to typhoid fever in the eight communes served from the filters, which, on an average, was 180 per 100,000 inhabitants in the early months of the year, has fallen to 43 since the construction of the filters. This rate is less than that of Paris for the same period, which was 67 per 100,000 inhabitants.

Electric Light Failure in a Theatre.—During the performance by Miss Jenny Mills, a popular dancer, at the Duchess Theatre, Balham, last Wednesday, the theatre was plunged in darkness by the failure of the electric light. Several gas-jets were brought into use without delay, so that there was no panic; and the audience waited quietly while the staff worked hard, but in vain, to restore the supply of current. Regretfully, the Manager informed the audience that it was impossible to continue the performance; and they left the building.

Co-operative Statistics.—The annual statistical report of the No. 1 District of the Co-operative Union has been issued by the Statistical Secretary, Mr. Robert Bell. It shows that the number of societies in the section amounted last year to 22, the same as in the previous year. The membership totalled 16,769, or an increase of 288. The share and loan capital was £244,412, an increase of £2538; and the reserve funds, £13,970, showed an increase of £1377. The sales made up an aggregate of £739,027, this being a decrease of £9201; and the net profit, £111,413, was also a drop of £7419. The accounts owing by members had gone up from £9224 to £9545. The average capital per member showed a decrease of 2s. 6d., and the average purchases a decrease of £1 6s. 6d.

Explosion of Petroleum in a Well.—Near Saint Brieuc, in Brittany, an extraordinary accident has happened in a well. A labourer went down to clean it, and never came up. He called from the bottom that he felt faint, and was being hauled up when he released his hold on the rope and fell in again. A gendarme went down, and was tying a rope round the lifeless man, when it was noticed from above that he was in difficulties; and he was drawn up just in time, as he was already unconscious. A sergeant then went down carrying a lantern with him. He had not been lowered many feet when there was a violent explosion, and a column of flame and smoke shot up from the well. The sergeant was pulled out with his head and face badly burnt; and five other men were injured. It was found that the well had opened up a subterranean stream of petroleum, the gas of which had slowly accumulated, and exploded when ignited.

Water Supply to Croston from Manchester.—At the monthly meeting of the Chorley Rural District Council last Tuesday, the Clerk (Mr. Whitfield) laid before the meeting the draft agreement between the Manchester Corporation and the Urban District Council of Croston as to the supply of water to be furnished by the former to the latter through the mains of the Rural Council. It was resolved that this authority should require that the supply agreed to be taken by the District Council should be fixed at a minimum of 90,000 gallons and a maximum of 250,000 gallons per week, and that such quantities should be taken as part of the water to be supplied to the Rural Council under the agreement for a water supply dated July 13, and made between the Corporation of Manchester and the Council, and not in addition thereto; also that the first part of clause 2 of the agreement between the Corporation and the Urban District Council relating to the manner of recording the quantity of water supplied shall be as follows: "The record of the supply shall be obtained from a meter or meters to be fixed as hereafter provided, and such meter or meters shall be read weekly by the Corporation and the Rural District Council of Chorley; and the measurements taken at such readings shall be checked by, and they and the charges based thereon in accordance with the terms of this agreement shall be subject to the approval of, the Rural District Council of Chorley."

Messrs. W. Sugg and Co., Limited, have sent us the new edition they have just issued of their list No. 11., comprising incandescent gas lamps and fittings. It consists of 55 large quarto pages, on which are shown lamps, chandeliers, brackets, and lighting accessories in endless variety. The catalogue has, as a kind of frontispiece, examples of the firm's lighting by means of their "Chertsey," "Belgravia," and "Newark" lamps at three large business establishments and at the Garrick Hotel, Charing Cross Road; and they furnish striking evidence of the effectiveness of incandescent gas as an illuminant. The catalogue has an artistic wrapper, on an inner page of which are indexes to the names and numbers of the appliances illustrated.

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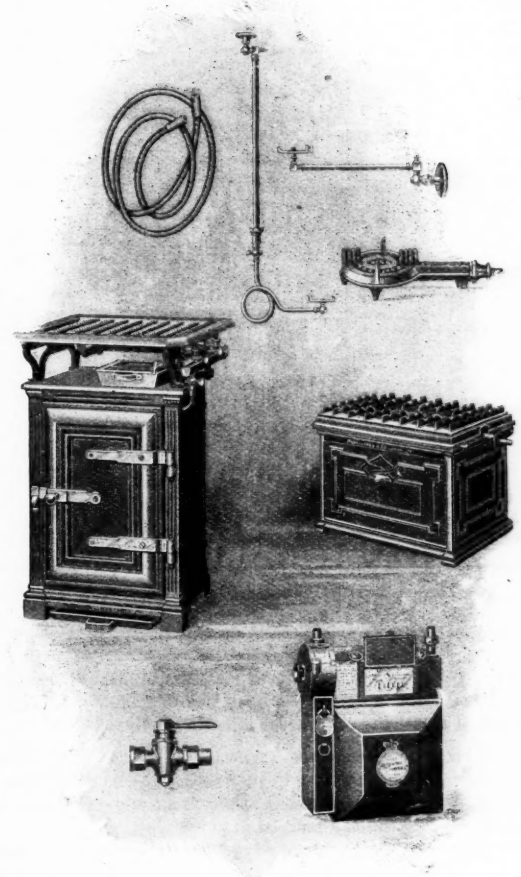

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Bell Barn Road, BIRMINGHAM.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.
DRAUGHTSMAN (General). No. 4638.
CARBONIZING FOREMAN. No. 4631.
GENERAL FOREMAN. Tottenham Gas Company. Applications by Sept. 17.
SULPHATE MAKER. No. 4640.

Situations Wanted.
LIGHTING OR WATER ENGINEER (Foreign and Colonial). No. 4633.
WORKS FOREMAN. No. 4639.

Company Meetings.
BRIGHTON AND HOVE GAS COMPANY. London Office. Sept. 14. Two O'clock.
CRAYS GAS COMPANY. St. Mary Cray. Aug. 29. 6.30 o'clock.

Plant (Second-Hand) Wanted.
GASHOLDER, PURIFIERS, &c. No. 4637.

For Sale.
CORRESPONDENCE COLLEGE COMPANY, Cambridge.

Plant (Second-Hand) for Sale.
CORNISH BOILER AND STEEL CHIMNEY. Redditch Gas Company.
DRY METER (250-Light). Pryce Jones, Ltd., Newtown.
EXHAUSTER, GOVERNOR, VALVES, &c. Keighley Gas-Works.
GASHOLDER. Holbeach Gas Company.
HYDRAULIC MAIN, ASCENSION PIPES, ROOF, &c. Barrhead Gas-Works.
LAMP PILLARS, &c. Newport (Salop) Gas Company.
VALVES, PIPES, &c. Rotherham Gas-Works.

Stocks and Shares.
BEXHILL WATER AND GAS COMPANY. Aug. 28.

TENDERS FOR

Coal and Cannel.
BRADFORD GAS DEPARTMENT. Tenders by Aug. 30.

Coke.
HALIFAX GAS DEPARTMENT. Tenders by Aug. 29.

General Stores, Charging Shovels, Cocks, Iron and Steel, Oil, Glass, &c , &c.
BRADFORD GAS DEPARTMENT. Tenders by Aug. 30.

Lamps.
BRADFORD GAS DEPARTMENT. Tenders by Aug. 30.

Lime.
BRADFORD GAS DEPARTMENT. Tenders by Aug. 30.

Meters.
BRADFORD GAS DEPARTMENT. Tenders by Aug. 30.

Pipes, &c.
BRADFORD GAS DEPARTMENT. Tenders by Aug. 30.

Shovels.
BRADFORD GAS DEPARTMENT. Tenders by Aug. 30.

Tar and Liquor.
WIDNES GAS DEPARTMENT. Tenders by Sept. 4.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 501

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	21—22	+1	4 15 5
160,000	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	May 11	7	Bomb'ay, Ltd.. . . .	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5⅝	+⅛	5 1 10
50,000	10	Mch. 9	14	Bourne- mouth Gas and Water } 10 p.c. . . B 7 p.c. . Pref. 6 p.c.	28⅜—29½	..	4 14 11
51,810	10	,,	7		17—18	..	3 17 9
53,200	10	,,	6		15½—16½	+⅛	3 12 9
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	260—265*	+3½	4 14 4
300,000	,,	,,	9½	Do. New . . .	198—203*	+2½	4 13 7
50,000	,,	,,	5	Do. 5 p.c. Pref. .	120—125	—½	4 0 0
906,250	,,	June 14	4	Do. 4 p.c. Deb. .	103—106	..	3 15 6
220,000	Stk.	Mch. 9	11½	Brighton & Hove Orig.	234—239	+2	4 14 2
246,320	,,	,,	8½	Do. A. Ord. Stk. .	167—172	+2	4 15 11
460,000	20	Apl. 11	10	British	41½—42½	..	4 14 1
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c. .	119—123*	+1½	4 17 7
165,700	,,	,,	4½	Do. do. 3½ p.c. .	90—93*	+1½	4 16 9
500,000	10	May 11	7	Buenos Ayres (New) Ltd.	12¾—13¾	+¼	5 9 10
250,000	Stk.	June 28	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
150,000	20	July 12	8¼	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	June 14	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.. .	9¾—10¼	..	4 7 10
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk.	98—100	..	4 10 0
1,443,280	Stk.	Feb. 22	5 1/10	Commercial 4 p.c Stk. .	115—117	..	4 8 10
560,000	,,	,,	5	Do. 3½ p.c. do. .	112—114	..	4 7 9
475,000	,,	June 14	3	Do. 3 p.c. Deb. Stk.	84—86	..	3 9 9
800,000	Stk.	,,	6½	Continental Union, Ltd.	123—126	..	5 3 2
200,000	,,	,,	7	Do. 7 p c. Pref.	140—145	..	4 16 7
432,070	Stk.	Aug.	5½	Derby Con. Stk. . . .	122—124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk. . . .	105—107	..	3 14 9
486,090	10	July 27	11	European, Ltd. . . .	24—25	..	4 8 0
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Aug. 15	4 1/10	Gas- light and Coke } 4 p.c. Ord. . . 3½ p.c. max. . . 4 p.c. Con. Pref. 3 p.c. Con. Deb.	98—99*	..	4 8 11
2,600,000	,,	,,	3½		87—89*	+¾	3 18 8
3,799,735	,,	,,	4		106—109*	..	3 13 5
4,193,975	,,	June 14	3		86—88	..	3 8 2
258,740	Stk.	Mch. 9	5	Hastings & St. L. 3½ p.c.	100—105	..	4 15 3
£2,500	,,	,,	6½	Do. do. 5 p.c.	121—124	..	5 4 10
70,000	10	Apl. 11	11	Hongkong & China, Ltd.	20—21	..	5 4 9
940,000	Stk.	May 11	8	Imperial Continental .	183—186	+2½	4 6 0
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	96—97*	+1	3 12 2
175,242	Stk.	Mch. 28	6	Lea Bridge Ord. 5 p.c. .	121—126	..	4 15 3

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Feb. 22	10	Liverpool United A . .	235—237	..	4 4 5
718,100	,,	,,	7	Do. B . .	170—172	+1	4 1 5
306,083	,,	June 28	4	L'rpool Unit'd Deb. Stk.	107—109	..	3 13 5
75,000	5	June 28	5	Malta & Medn., Ltd. .	4¼—4⅜	..	5 5 3
560,000	100	Apl. 2	5	Met. of } 5 p.c. Deb..	103—105	..	4 15 3
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	May 31	3½	Monte Video, Ltd. . .	11—12	..	5 16 8
1,675,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.	110—112*	+1½	4 2 7
406,025	Stk.	June 29	3½	Do. 3½ p.c. Deb.	97—99	..	3 10 8
15,000	10	Mch. 9	10	North Middlesex 10 p.c.	20—21	+½	4 15 3
52,940	10	,,	7	Do. 7 p.c.	13½—14½	+½	4 16 7
300,000	Stk.	May 11	8	Oriental, Ltd. . . .	150—153	..	5 4 7
600,000	5	Mch. 28	7	Ottoman, Ltd. . . .	6—6½	..	5 7 8
398,490	5	Apl. 26	7	Primitiva Ord. . . .	6¾—7¼	+⅛	4 16 7
796,980	5	July 27	5	Do. 5 p.c. Pref. .	5⅛—5⅜	..	4 13 0
488,900	100	June 1	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
851,070	10	Apl. 26	7	River Plate Ord. . . .	12¾—13¼	+¼	5 5 8
300,000	Stk.	June 28	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Mch. 28	8	San Paulo, Ltd. . . .	14¼—14¾	..	5 5 8
70,000	50	July 2	5	Do. 5 p.c. Deb. .	49—51	..	4 18 0
135,000	Stk.	Mch. 28	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	243—245	..	4 1 8
523,500	,,	,,	10	Do. C	243—245	..	4 1 8
70,000	10	May 31	10	South African	16—17	..	5 17 8
6,350,000	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	131—133*	+¾	4 2 8
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	86—88	..	3 8 2
575,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	122—125*	+¾	4 8 0
60,000	,,	,,	5	Do. 5 p.c. Pref. .	123—126*	+¾	3 19 4
112,533	,,	July 12	5	Do. 5 p.c. Deb. Stk.	128—133	..	3 15 2
502,310	Stk.	May 11	5	Southampton Ord. . .	107—112	..	4 9 3
120,000	Stk.	Mch. 9	6½†	Tottenham } A 5 p.c. .	127—130	+3	5 0 0
388,020	,,	,,	5†	and } B 3½ p.c. .	102—105	+3	4 15 3
137,500	,,	June 28	4	Edmonton } 4 p.c. Deb.	103—105	..	3 16 2
182,380	10	June 14	8	Tuscan, Ltd.	10¼—10¾	..	7 8 10
149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	100—103	..	4 17 1
30,000	Stk.	Aug. 15	8	Wands- worth and Putney } A 5 p.c. . . B 3½ p.c. . . C 3½ p.c. . . 3 p.c. Deb. Stk. West Ham 5 p.c. Ord. Do. 5 p.c. Pref. . . Do. 4 p.c. Deb. Stk.	—	..	—
255,636	,,	,,	6½		133—138*	+1½	4 14 2
75,000	,,	,,	5⅝		110—113*	+¾	4 19 1
79,416	,,	June 28	3		82—85	..	3 10 7
279,875	,,	Aug. 15	5⅛		105—107*	+1⅛	4 15 9
185,000	,,	,,	5		120—123*	+½	4 1 4
193,300	,,	June 28	4		104—107	..	3 14 9

Prices marked * are "Ex div." † Next dividend will be at this rate.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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